Univ. of
Toronto
Library

BINDING LIST DEC 1 5 1923.

Science

1919 VOL. XXXIII 1920

The Canadian Field-Naturalist

Being Volume XXXV
of the Transactions of
the Ottawa Field-
Naturalists Club

186437
9.1.24

Organized March, 1879 Incorporated March 1884

QH
1
C1515
v.33-36

Digitized by the Internet Archive
in 2010 with funding from
University of Toronto

http://www.archive.org/details/canadianfieldnat33v36otta

THE CANADIAN FIELD-NATURALIST

VOL. XXXIII. APRIL, 1919. No. 1.

INTRODUCTORY.

With the March, 1919, issue, THE OTTAWA NATURALIST, the official organ of the Ottawa Field-Naturalists' Club, ceased to exist under that name. THE OTTAWA NATURALIST had a long and honourable career. Like all similar publications it had its trials, its ups and downs, financial troubles, etc., but it weathered all storms and appeared fairly regularly during its thirty-two years of existence. In its pages are to be found many articles of great scientific value and we would like to have space to remind our readers of at least some of the more important of the contributions which it presented. With the increase in its size, improvement of paper, specially prepared articles, etc., Vol. XXXII, certainly may be regarded as an excellent production and one which has brought forth many words of encouragement from its readers.

This, the April issue of the organ of the club appears under a new name—THE CANADIAN FIELD-NATURALIST. Such a change was intimated in the April, 1918, issue of THE OTTAWA NATURALIST, and at the recent annual meeting of the Club, held on March 18, 1919, the same was duly approved. This change in name will not, of course, affect in any way the spirit of the publication. Such change only reflects its widened sphere of influence. We hope it will develop along improved lines and ultimately be accepted as the organ not only of The Ottawa Field-Naturalists' Club, but of similar organizations throughout Canada. There is an excellent opportunity for the naturalists of Canada to assist in building up this publication and making it truly representative of Canadian scientific research. The popular side will, of course, not be overlooked. Special efforts will be made to make it useful to amateur naturalists, teachers and the public generally.

The subscription price for the present volume which will contain six issues, namely for the months of April, May, September, October, November and December will be $1.00. Thereafter the volumes will consist of nine issues each volume beginning with the January number; the subscription price of each volume will be increased proportionately.

NOTES ON THE CASPIAN TERN *(STERNA CASPIA)* AND THE PARASITIC JAEGER *(STERCORARIUS PARASITICUS)* IN MANITOBA.

BY PROFESSOR CHAS. H. O'DONOGHUE, D.Sc., AND J. NELSON GOWANLOCK, B.A.,
FELLOW IN ZOOLOGY, ZOOLOGICAL DEPARTMENT,
UNIVERSITY OF MANITOBA.

Island faunæ, ever an interesting field in ornithology, become particularly attractive in continental areas where lake islands afford the only suitable breeding grounds for certain water birds.

The following observations refer to a small but interesting island in the northern part of Lake Winnipeg visited on July the 9th and 13th, 1918, whereon a colony of Caspian Terns *(Sterna caspia)* was found. No record of this species breeding in Manitoba has hitherto been published. A specimen of Parasitic Jaeger *(Stercorarius parasiticus)* was also secured and constitutes the first inland record for this province.

Through the courtesy of the Riverton Fish Company, of Riverton, Man., the authors were enabled to make the journey—a round trip of some 500 miles—from Hnausa to Berens Island. The objects of the trip were first to study if possible, breeding colonies of White Pelicans *(Pelecanus erythrorhynchos)* and second, to gather some idea of the biological conditions on the northern portion of the lake. The original intention to make Reindeer Island the base proved impracticable and a camp was established at Swampy Bay, Berens Island, where the Riverton Fish Company maintained a large fishing station. We desire to express

our warm appreciation of the sympathetic assistance afforded by the men at the stations, particularly by Mr. Johnny Jonasson. Berens Island was chosen mainly because of the possibility that White Pelicans would be found breeding on Pelican Island which lies some four or five miles west of Berens Island.

Pelican Island lies approximately in longitude 95½ and latitude 52½ and is a typical, rocky lake island, some ten to fifteen acres in extent. Between Pelican Island and the northern shore of the lake, there are no islands and so its north coast meets the full force of the waves raised by the winds sweeping across this 100 miles of open water. Lake Winnipeg with its area of over 8,000 square miles, is very dangerous owing to its quick changes from calm to storm and fishermen familiar with the whole lake, declare this region between Pelican and Berens Islands to be the worst. The shores of Pelican Island are extremely rocky—there are no sand beaches—and a landing from a rowboat requires cautious management even in calm weather. The island is partly wooded with birch, ash, etc., but inland the ground is depressed in a basin-like central hollow, overgrown with marsh vegetation. A barren tongue of land juts out from the east side of the island forming a shingle spit.

THE TERNERY.

The first time the authors approached the island in a skiff, flocks of birds were observed resting on the eastern point, while with prism binoculars, Herring Gulls and Terns could be distinguished everywhere along the shingle spit and adjacent shore. Two young Herring Gulls, still in natal down, ran down the beach to the water as the boat reached land. One of these was captured. The uproar among the birds caused by the landing increased when the shingle spit was reached. Numerous deserted Herring Gulls' nests, substantially built of vegetable debris, lined the edge of the grass zone or were scattered over the bare pebbles and everywhere were the remains of pellets disgorged by the gulls. No eggs were found until the zone of vegetation had ended, when, passing out onto the bare eastern spit, a densely populated ternery was discovered. Over this space were between 200 and 300 occupied nests, frequently almost touching, each containing one or two eggs. After a brief survey of the ternery, a low hiding blind was erected and left for the birds to return to the colony.

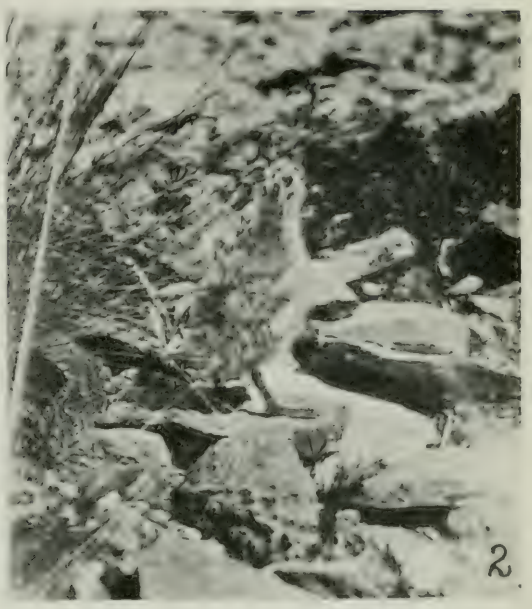
On returning later, the whole colony was seen to be still on the wing, shrieking and screaming above the breeding ground. The cause was soon revealed. In the midst of the colony was a fisherman methodically gathering the eggs from the nests. The old fellow could scarcely understand English and after much difficulty, it was explained that some of the nests were to remain undisturbed. The birds were now so thoroughly alarmed that an hour spent in the hiding-tent in the hope of photographing them proved vain and the remaining hour or so of light was expended in examining and photographing the nests and eggs. An adult Caspian Tern was collected together with some clutches of eggs. A fair portion of the colony had not been disturbed. It was hoped that the next visit would find the owners of these nests back at the task of incubation and so the hiding-tent was left in position, as carefully concealed as possible.

On July 13, Pelican Island was re-visited. The birds were observed as before, resting on the rocks and along the shore. On approaching the breeding ground, the usual alarm of the parent birds was not in evidence and closer examination showed that every remaining egg had been destroyed—evidently by crows *(vide infra)* and on the whole spot not a single occupied nest remained. A specimen of Parasitic Jaeger and two still occupied Herring Gull nests were also discovered during this visit.

Reference to the published records of Manitoban birds yielded only an isolated record of the Caspian Tern. It is not mentioned by Bell (3) nor by E. Thompson Seton (11 and 12) and is recorded only by Nutting (6) whose record is cited by Preble (7). Nutting collected a single Caspian Tern on Lake Winnipeg at the mouth of the Saskatchewan river in 1892. The A.O.U. Check List (1) says of the Caspian Tern: "Range nearly cosmopolitan" but gives few North American breeding records, viz: "Great Slave Lake, Klamath Lake, Oregon, on islands of northern Lake Michigan, on coast of Southern Labrador, and also on coasts of Texas, Louisiana, Mississippi and (formerly) Virginia". The discovery of such a colony in Lake Winnipeg is, therefore, of unusual interest.

Although there are no published records of the species breeding in Manitoba, we have reason to believe that it was previously recognized by Mr. Eric Dunlop, since killed in action in France, a naturalist who in 1914 and 1915 collected in northern Lake Winnipeg for the Carlisle Museum, Carlisle, England. Dunlop is said to have found the Caspian Tern breeding on the west coast of Reindeer Island, but, unfortunately, his records are not available. While in the north, the authors met with Dunlop's chief guide, Capt. Goodman, who through his work with Dunlop had become acquainted with many of the birds. Capt. Goodman stated that in 1914 the Caspian Terns were found breeding only on the west shore of Reindeer Island and had not been noted anywhere else although numerous islands, including Pelican Island, were then visited.









1. Pelican Island. The shingle spit upon which the ternery was situated is visible in the foreground of the island.

2. Young Herring Gull. The rocky character of shore adjacent to the ternery is here shown. July 8, 1918.

3. Caspian Tern's nest showing remarkable variation in eggs of single clutch. Also exceptional in its employment of drift to form a "nest".

4. Typical nest of Caspian Tern. Note entire absence of vegetable nesting materials.

The Caspian Terns' nesting ground was a compact area situated on a slope of the shingle spit and measured only some 20 yards by 30 yards. The ternery sloped from some 10 to 12 feet above lake level at the highest point down to some four feet above lake level at the lowest point. In this space were well over 200 nests. Somewhat over 400 eggs were noted and exact measurements taken of 46 of them. A small, peculiar pond to the west of, and some 10 yards from the boundary of the ternery, contained a few water plants and algæ and was well populated with large frogs *(Rana pipiens)*. This pond showed every evidence of being much visited by the birds. Between 600 and 800 adult Caspian Terns must have been observed on the first visit, the birds resting on the stones along the shore, fishing off-shore or flying together with Herring Gulls and Common and Forster Terns above the island. The stomach of the individual shot contained remains of small fish. The identity of the species was first suspected from the size and shape of the eggs, later determined by close range observation from the hiding-tent and finally confirmed by the finding of dead specimens and the shooting of an adult female.

The nest frequently consisted of mere depressions in the shingle, absolutely no vegetable or other materials being utilized. In some other instances, grass bents, dead rushes, bits of drift, etc., were gathered together forming a rude, basin-shaped structure. Thus the type of nest appears to resemble most closely that of Lesser Tern *(Sterna minuta)* (9) and not that of the Common Tern *(Sterna hirundo)* (10) which most frequently builds quite a noticeable nest of gathered materials. The deserted and much better constructed nests of Herring Gulls were occasionally used by the Caspian Terns, apparently no additions or alteration being made by the new tenants. In no case did the number of eggs in a nest exceed two. Frequently, there was only one egg, usually fresh, in a nest. It is of interest that Van Winkle (5) records three as the usual number of eggs per nest on the Gravel Gull Islands, Lake Michigan, whereas we found that in some cases where there were two eggs in the nest, they were both in such an advanced stage that there would have been ample time for the third egg to have been laid had three been the normal number of the clutch.

The eggs exhibited a considerable range of variation in color, size and type of marking, but destruction by the fishermen and the crows prevented the taking of a series of measurements similar to those made by Rowan, Parker and Bell (10) as was originally intended. The measurement of a characteristic series of 46 eggs was fortunately secured, from which the following data were obtained:

Average length, 63.59 m.m.; average breadth, 43.84 m.m.; greatest length, 72.00 m.m.; shortest length, 56.00 m.m.; greatest breadth, 46 m.m.; least breadth, 41.00 m.m.

The two eggs of a clutch sometimes differed considerably, though a sufficient number were not examined to allow of satisfactory statistical treatment. Thus: in clutch No. 33 the two eggs were 70 x 46 and 67 x 45 m.m.; in clutch No. 23 the two eggs were 66 x 45 and 63 x 43 m.m.

Like differences were found also in color, for in one nest one egg was of a pale blue background with a few very faint spots, while the second was heavily spotted and blotched with black upon a brown background. The eggs that were opened and examined exhibited every stage of development from practically no incubation, the primitive streak stage, through to large embryos. The majority, however, were fresh. None seemed less than a week from hatching.

THE PARASITIC JAEGER.

The Parasitic Jaeger *(Stercorarius parasiticus)* of which a specimen was found on July 23 on the north end of Pelican Island, is also a bird of some interest as it is the first record for this area. The Canadian Catalogue of Birds (Macoun, 5) gives the following record for Hudson Bay: "a specimen of the melanistic form (of *Stercorarius parasiticus*) taken at Fort Churchill, Hudson Bay, 1845 (Dr. Gillespie, Jr.)" Preble (7), however, records the species as occurring on the coast of Hudson Bay, below Cape Eskimo in 1900. Both of these, however, are on the sea-coast and at least 500 miles north of Pelican Island. The two other members of this strange genus, the Pomarine Jaeger *(Stercorarius pomarinus)* and the Long-tailed Jaeger *(S. longicaudus)* have been recorded for Manitoba, the former on Hudson Bay (Preble, 7) and the latter once from Aweme, Man., May, 1903, by Mr. Norman Criddle (Macoun, 1909) and also once from Clandeboye, Man., October, 1902, by Atkinson (2).

The specimen of Parasitic Jaeger which the authors discovered was lying dead on the rocky ground above the drift line in the midst of a deserted Herring Gull colony. The individual was an example of the white phase. From the situation and appearance of the bird it is possible that it had been killed by Herring Gulls while poaching on the colony, a fate several times recorded for this species.

OTHER BIRDS.

The following observations were made concerning other species of birds noted on Pelican Island:

HERRING GULL *(Larus argentatus)*. This species

had practically completed breeding. Over 300 deserted nests and but four occupied nests were discovered—three with well-grown young and one with eggs.

RING-BILLED GULLS *(Larus delawarensis)* were noted in company with the last species.

FORESTER'S TERNS *(Sterna forsteri)* and COMMON TERNS *(Sterna hirundo)* were numerous, almost equalling the Caspian Terns in numbers. The gulls and terns all consorted together freely.

BLACK TERNS *(Hydrochelidon nigra surinamensis)* were entirely absent although they are quite numerous in the south end of Lake Winnipeg.

WHITE PELICAN *(Pelecanus erythrorhynchos)* were not noted, although excreta and two humeri were found. However, the species was regularly observed fishing in Swampy Bay, five miles from Pelican Island, so it probably is a frequent visitor here also.

SCAUP DUCKS *(Marila marila* or *M. affinis)* were observed, five or six individuals together, resting on the water not far offshore from the ternery.

MALLARD *(Anas boschas)* were observed and one adult female collected.

WHITE-WINGED SCOTERS *(Oidemia deglandi)* are frequently caught and drowned in the fishermen's nets. They probably visit Pelican Island frequently.

Two or three LEAST SANDPIPERS *(Pisobia minutilla)* were observed on the beach.

LESSER YELLOW-LEGS *(Totanus flavipes)* were seen feeding along the water-edge.

A PECTORAL SANDPIPER *(Pisobia maculata)* was shot out of a flock of five feeding near the ternery.

Several SPOTTED SANDPIPERS *(Actitis maculata)* were found feeding along the shore.

NIGHT HAWKS *(Chordeiles virginianus)* were noted at Swampy Bay and very probably inhabit Pelican Island. None was observed probably because both visits were made during daylight hours.

CROWS *(Corvus brachyrhynchos)* were common on the island. When the ternery was first visited, the crows gathered near at hand to watch the proceedings. When the second visit was paid, the crows were disturbed from the area of the ternery itself, where they were engaged in eating the Caspian Terns' eggs. The crows appear to feed largely upon the dead fish cast up by the water and they were constantly observed patrolling the shores in search of such food. Nests were found in considerable numbers.

SAVANAH SPARROWS *(Passerculus sandwichensis savanna)* were in song and apparently breeding near the ternery.

CEDAR WAXWINGS *(Bombycilla cedrorum)* were common in the trees on Pelican Island. They were still in flocks and had not yet, apparently, begun nesting.

RED-EYED VIREOS *(Vireosylva olivacea)* were noted here as they were on every island and bit of the wooded shore the authors visited during the whole trip.

YELLOW WARBLERS *(Dendroica aestiva aestiva)* were common and breeding.

BLACKBURNIAN WARBLERS *(Dendroica blackburniae)* were noted and were in full song.

The discovery of the Caspian Tern Colony on Pelican Island is especially interesting in the light of our knowledge of the distribution of this bird. The A. O. U. Check list (1) gives the winter range of this species as "South Atlantic and Gulf Coasts". To and from this region, logically, the Pelican Island terns must each year journey; yet there is not a single record of a Caspian Tern being collected in Central or Southern Manitoba. The route of migration that would seem most reasonable is that down the Red-River-Mississippi Valley chain, yet this absence of records proves fairly conclusively that the Caspian Terns do not regularly or in numbers, traverse this path. The alternative suggestion is a migration route by way of Hudson Bay, thence to the Atlantic coast and thence southward. The Pelican Island and Reindeer Island colonies might thus possibly be explained as an invasion of this species from Hudson Bay, these islands—the outliers of the numerous islands including Berens Island—being the first of the group upon which the species has established itself. The birds in going to their winter range, still probably use the old route of invasion and travel circuitously out by way of Hudson's Bay and the Atlantic coast. Analagous to this might be cited the case of the Bobolink *(Dolichonyx oryzivorus)* which, according to Cooke (4) has invaded Utah by extending its range far westward, then southward yet in returning to its winter home in southern Brazil, the Utah bobolinks do not go directly, but move along their old invasion route, *i.e.*, they first journey northward, then eastward, then they turn south to their distant winter range. It is conceivable that in the case of the bobolink, a frequenter of damp meadows, its choice of route is partly, perhaps largely, determined by following such suitable localities and therefore it does not cross the arid regions to the south and southeast of the points reached in its new advance. Indeed it is only since the extension of irrigation in certain parts of Utah that it has made its appearance there. Whereas the Caspian Tern, having once got into the lake region has practically an unbroken inland water system over which it could return to the south.

The Pelican Island colony is declared by the

fishermen, who recognize the Caspian Tern to be a new bird on the lake, to date within the last few years. Indeed the earliest definite information regarding it was their report that three years previous to our visit, a wolf crossed to Pelican Island from Swampy Bay and destroyed all eggs and young birds in the colony. The species was not found by Dunlop when he visited the island in 1914 and it is hardly possible that he could have missed it had it been there. Capt. Goodman stated that, on Reindeer Island, Dunlop found the Caspian Terns breeding as late as mid-August.

REFERENCES.

1. American Ornithologists' Union, 1910, Check List of North American Birds, Third Edition, New York.
2. Atkinson, George E., 1904. Rare Bird Records of Manitoba. Transaction 65, The Historical and Scientific Society of Manitoba, Winnipeg.
3. Bell, Robert, 1879. Report on Expeditions on the Churchill and Nelson rivers, etc. Report Prog. Can. Geol. Society, 1878-79. Ottawa. Birds, pp. 67c to 70c.
4. Cooke, Wells W., 1913. Bird Migration. U. S. Dept. Agricul. Bulletin No. 185. Washington.
5. Macoun, John, and Macoun, James M., 1909. Catalogue of Canadian Birds. Department of Mines, Ottawa.
6. Nutting, C. C., 1893. Rep. on Zoological Explorations on the Lower Saskatchewan river. Bul. from the Laboratories of the State University of Iowa, Vol. II, No. 3. Article IV, pp. 235-293. January, 1893.
7. Preble, E. A., 1902. A Biological Investigation of the Hudson Bay Region, N.A. Fauna. No. 22, Wash. Birds, pp. 75-131.
8. Rowan, William, 1915. The Blakeney Point Ternery, Blakeney Point Publication No. 13.
9. Rowan, William, no date. The Little Tern, Blakeney Point Publication No. 17.
10. Rowan, William, Parker, K. M., and Bell, Julia, 1914. On Homotyposis and allied characters in the egg of the Common Tern. Biometrika, Vol. X, No. 1.
11. Seton, E. T., 1909. The Birds of Manitoba. A Handbook to Winnipeg. Pub. by the local committee Brit. Ass. Adv. Sci., Winnipeg.
12. Thompson, E. E. (—E. T. Seton), 1891. The Birds of Manitoba. Proc. U. S. Nat. Mus., Vol. xiii, pp. 457-643, Wash.

DOUGLAS FIR SUGAR

BY J. DAVIDSON, F.L.S., F.B.S.E., INSTRUCTOR IN BOTANY, UNIVERSITY OF BRITISH COLUMBIA.

Much interest has recently been aroused over what appears to be phenomenal deposits of sugar on the leaves of Douglas fir *(Pseudotsuga taxifolia)* in certain areas of British Columbia. Although Douglas fir sugar has been known to the Indians of the dry-belt for many years, its occurrence seems to have been overlooked by the numerous surveyors and others who have travelled in the province; at least, in-so-far as the writer is aware, no record has been made of its occurrence previous to 1915, when an illustration appeared in the British Columbia Botanical Office Report for the year 1914, showing a branch of Douglas fir laden with white masses of sugar. This photograph was prepared from specimens received from Mr. Jas. Teit, of Spence's Bridge, B.C., who, in connection with his ethnological work on the plants used as food by the British Columbia Indians, wished to have an explanation of the deposits; Mr. Teit also forwarded samples of Douglas fir sugar to Dr. E. Sapir of the Geological Survey of Canada, who had the samples analyzed.

During the summer of 1917, when the European conflict caused an increase in the cost of living and the introduction of measures to economize sugar, interest in this phenomenon was renewed and intensified by the appearance of a glowing account supplied to one of the Vancouver newspapers by some irresponsible contributor. As a result, a number of people became quite enthusiastic regarding this "new" discovery and hastened to ascertain its commercial possibilities.

In view of the fact that many people in Canada are interested in the phenomenon, and at the request of Mr. Teit, the writer consented to give a summary of what is known regarding Douglas fir sugar and the factors influencing its exudation as deposits on the leaves. All the information relating to the distribution and habitats of sugar-bearing Douglas firs was supplied by Mr. Teit who, being resident in the heart of the dry-belt and having an intimate knowledge of the Indians of the interior, was best able to secure the necessary data.

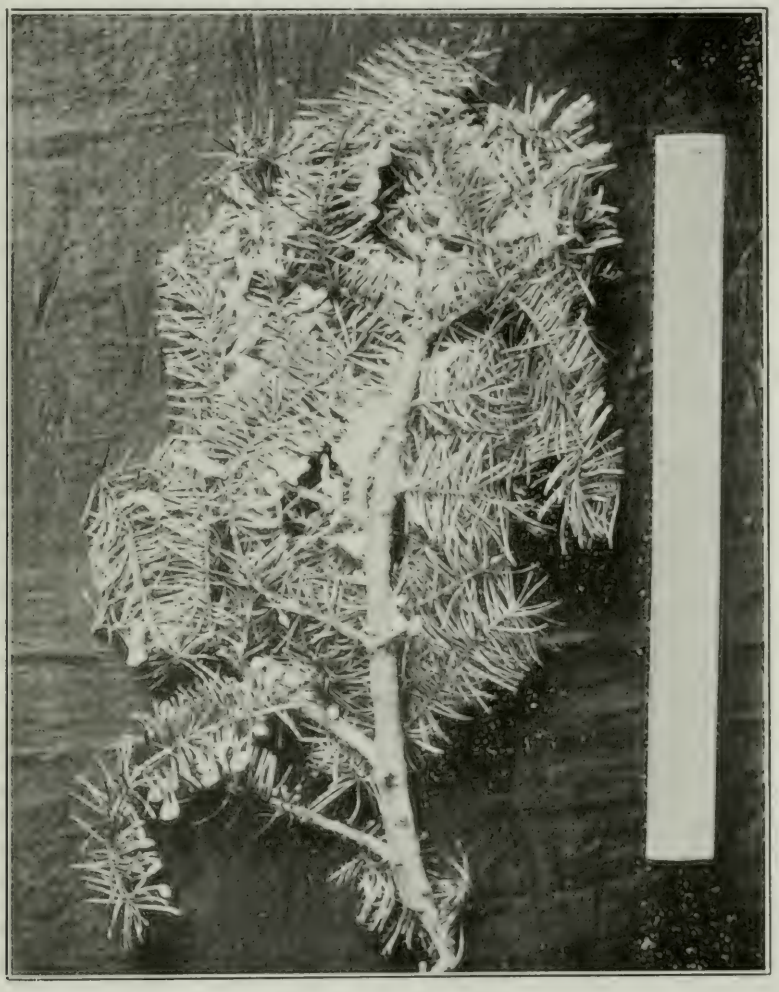
It appears that Douglas fir sugar cannot be relied on as an annual crop. Some years it is abundant, other years little or none is found. It is therefore regarded by Indians as an extra, rather than a necessary part of their food supplies, but when available in quantity it is collected and may be kept for future use.

NOT THE WORK OF INSECTS.

Previous to having seen the specimens, the writer suspected that the sugar had been produced as an exudation on the leaves through punctures made by insects possibly aphides; such as is said to occur on *Tamarix mannifera* which, when attacked by a *Coccus*, yields a kind of mucilaginous sugar—the manna of Mt. Sinai; but information to the effect that only healthy trees produced the sugar and that such trees were practically free from insects,

with the exception of such as were feeding on the sugar, led one to suspect that the sugar might be related to the manna of commerce, obtained from several species of ash *(Fraxinus)* as an exudate which assumes the form of flakes or fragments.

When specimens were received, however, in the summer of 1914, it was seen that none of the previously recorded sugars corresponded with the peculiar masses formed by Douglas fir. A careful search for information as to its chemical analysis revealed nothing to show that even its occurrence was known. On account of its interest and novelty at the time, the photograph in the Botanical Office Report was supplied to record its occurrence and illustrate the phenomenon, pending an investigation into the circumstances under which it was formed, and pending the results of the analysis which was then being carried out by Dr. F. T. Shutt, Dominion Chemist, at Ottawa.



Branch of Douglas fir laden with white masses of sugar. (From B. C. Bot. Office Rep., 1914).

APPEARANCE OF THE SUGAR.

The sugar appears as white masses varying in size from ¼ of an inch to 1½ or 2 inches in diameter. The smaller masses are formed like white drops at the tips of single leaves, occasionally two or three leaf-tips are inbedded in larger drops, while the largest masses are usually scattered irregularly over the leaves and branchlets.

The sugar tastes decidedly sweet, passing temporarily into a pasty consistency during dissolution in one's mouth; it is completely soluble. When collected it is quite hard and dry, with no tendency to be sticky. A slight rain is sufficient to dissolve the

sugar off the trees, and patches of recrystalized sugar may then be found at the base of trees or on the ground. Frequently, however, in this situation it does not recrystalize but may be found in a fluid or semi-fluid condition which is attractive to flies and other insects. Sometimes, as above mentioned, insects feed on the sugar while still on the trees, and it is reported that bears go after it, causing the breakage of many branches.

EXUDATIONS BY OTHER PLANTS.

As is well known, many plants have structures known as waterpores,, situated usually at the tip or apex of the leaves, and, in the case of lobed leaves, often at the tips of the lobes or teeth along the margin. Occasionally when the root-pressure is very active, so much water is forced up into the plant that the leaves become gorged with water which escapes through these water-pores—comparable to a kind of safety valve. Most people are familiar with the drops of water at the tips of grass leaves in the morning after a hot dry summer day and a cool, clear night, giving origin to the Scotch saying, "Ilka blade o' grass keeps its ain drap o' dew".

In some localities, where the soil is calcareous, minute white incrustations of lime are found around the water-pores; these incrustations may be found on grasses, and are of common occurrence on certain species of Saxifrages which show them on every tooth along the margin of the leaves, such incrustations are small, and are only formed under certain ecological conditions, in which temperature of the soil and atmosphere, and water content of the soil are important factors.

FACTORS INFLUENCING EXUDATION OF SUGAR.

A review of the distribution, and various factors influencing the production of sugar by Douglas fir, will prove of especial interest to physiological and ecological botanists, to whom the phenomenon will serve as a splendid illustration of the influence of environment on a plant which under ordinary conditions in British Columbia does not exude sugar.

DISTRIBUTION.

The region in which sugar-bearing Douglas firs are most abundant, lies between the 50th and 51st parallels and between 121°-122° long.. This includes the driest and hottest part of the dry-belt of British Columbia. Within this area they are rather common in the Thompson valley west of the mouth of the Nicola river, also near the junction of the Thompson and Fraser rivers at Lytton; they have been found a little above Lilloet in the Fraser valley, but according to present information are not known to occur north of Clinton in this region.

About 10 miles north of the apex of the angle formed by the junction of the Thompson and Fraser rivers, lies Betani valley, at an altitude of between 3,500 and 4,000 feet, some years sugar is comparatively abundant on trees in this region; the geology and flora is very different from that of the adjacent Thompson or Fraser valleys; here one may find sugar-bearing Douglas firs growing on the southern and south-western slopes having the greatest sun exposure. The soil produces a thick covering of grass and other vegetation, indicating a plentiful supply of available soil moisture; differing in this respect from the dry gravelly southern and south-western slopes of the main valleys of the Fraser and Thompson.

Suitable habitats are found at intervals over a considerable area of the dry-belt regions, in addition to samples received from the north and south sides of the Thompson river near Spence's Bridge, Douglas fir sugar has been reported from around Kamloops and Savona, also from the Nicola and Similkameen valleys, and is said to be found in the southern part of Okanagan valley. In-so-far as the chief of the Kootenay Indians is aware, it is not known in the Kootenay country although it is reported by an Indian as being found in eastern part of Washington state, United States.

HABITATS.

The habitats in which sugar-bearing firs are found, are usually on gentle slopes facing east or north in that region of the dry-belt where the Douglas fir is encroaching on the dry-belt flora. The trees are in comparatively open areas with abundant exposure to the sun.

SOIL MOISTURE.

As a rule, sugar is not found on trees situated on fully exposed southern or western slopes, nor on areas where Douglas fir forms a dense forest. Southern and western slopes, exposed to the full heat of the sun, dry out much sooner than ground gently sloping to the east or north; the greater abundance of soil moisture in the latter is a point to be kept in mind.

ABUNDANT SUNSHINE.

In the region above mentioned the descending zone of the Douglas fir and the ascending zone of yellow pine overlap, so that the trees are well exposed to the sun, not being so crowded as to limit the foliage to a narrow crown, as happens in dense forests. An abundance of leaves exposed to the sun will result in an abundant formation of carbohydrates during the day; under ordinary conditions these carbohydrates would be removed from the leaves and transported to growing tissues or storage tissues during the night. This normally takes place in most plants, including Douglas fir in its natural habitat in the coast area where it forms dense forests of gigantic trees.

TEMPERATURE OF SOIL AND AIR.

In the dry-belt area it is evident that Douglas fir trees are exposed to the sun for a greater number of hours per day, the soil and atmosphere is warmer, the forests are more open, with freer circulation of air, than Douglas fir forests in the coast area.

MAXIMUM ROOT-PRESSURE.

It appears then that in years when Douglas firs are fully exposed to a long succession of hot, cloudless days in midsummer, and provided with the requisite soil conditions (*i.e.*, temperature and available water) the trees gradually accumulate an excess of carbohydrates during the many hours daily exposure to sun, the increasing temperature of the soil enables the cells of the roots to maintain or increase their activity during the night, which in dry-belt regions in midsummer is very short, and during which root-pressure is at its maximum.

DRY ATMOSPHERE.

When night comes on, the chlorophyll-containing guard-cells have ceased photosynthesis, the guard-cells become isotonic (*i.e.*, of equal concentration) with the surrounding cells, and the stomata close; so that even during warm nights little evaporation can take place from leaves so well protected with cutin. As a result of the increased root-pressure and cessation of transpiration the leaves become gorged with water in which the sugar—formed by the reconversion of starch into sugar—is dissolved and exuded as drops at the tips of the leaves. The warm dry atmosphere at that time of the year causes the rapid evaporation of the water, leaving the sugar in the form of drops of various sizes as a deposit at the tip. Occasionally two or three such drops come in contact with each other and fuse to form one large drop, frequently they become so large that they fall from the leaf tips onto the leaves or branches below; a succession of these large drops cause the formation of the larger irregular deposits referred to above.

There is no doubt about the exudation of the sugar from the leaf-tips; deposits may be found in all stages, from mere traces up to large drops, in some cases just dried as they were about to fall.

With a knowledge of the ecological conditions under which Douglas fir exudes sugar, one can understand why it may be rare or absent in some years; one or two dull, cool, or wet days would suffice to alter one or more of the factors which play a necessary part in promoting its exudation. A dull day would enable the tree to utilize much of the excess sugar or store it as starch or other reserve food. A cool day would diminish the activity of the sugar forming cells in the leaves, and by lowering the temperature of the soil would lessen the activity of the roots, thus diminishing the root-pressure and exudation of water, while a wet day and subsequent evaporation from the soil would more effectually lower both the soil and atmospheric temperatures. Other factors would be affected, but the above summarizes the main points.

ANALYSIS OF THE SUGAR.

The results of Dr. Shutt's analysis of two samples—one supplied in 1914, the other in 1917—indicate a high degree of constancy of composition of Douglas fir sugar.

The preliminary analysis made in 1914 gave the following results:

Total sugars after hydrolysis	96.25%
Reducing sugars	23.3

The analysis of the 1917 sample furnished the following data:

Total sugars after hydrolysis	91.91
Reducing sugars	24.86
Foreign matter, etc., insoluble in water	.64
Moisture	7.00

Subsequent to the analysis, a contribution* from the Carbohydrate Laboratory of the Bureau of Chemistry, U.S. Department of Agriculture, Washington, D.C. a laboratory especially equipped for the examination of saccharine substances, reports a complete analysis of the same product.

A summary of their findings is as follows:

"The sample of Douglas Fir manna yielded about 50% of pure crystalline melezitose, and there is evidence that the manna contains sucrose and some reducing sugar probably a mixture of glucose with a smaller quantity of fructose. The percentage composition of the sample of dry manna that we examined was approximately:

Melezitose	75-83%
Sucrose	2.9%
Reducing Sugars	11.5%"

Melezitose is an extremely rare trisaccharide of the formula $C_{18}H_{32}O_{16}$ which on hydrolysis yields glucose and turanose, the latter is very difficultly hydrolysed to glucose and fructose but in the conventional methods of sugar analysis, the only product of hydrolysis having direct reducing action is glucose.

*"The Occurrence of Melezitose in a Manna from the Douglas Fir, by C. S. Hudson and S. F. Sherwood (Journal of the American Chemical Society, Vol. XL, No. 9, 1918).

MUSEUMS AS EDUCATIONAL INSTITUTIONS.

By M. Y. Williams.

Ask the average Canadian to name our educational institutions and it is scarcely likely that "Museums" would be included in the list. Ask a dweller in New York City the same question, and if he omitted "Museums" he would show that he failed to appreciate the advantages at his very doors.

Modern pedagogy recognizes the importance of studying objects rather than the description of objects; the modern museums display, in instructive and attractive manner, things gathered from the great and wonderful world around us. We have primary and secondary schools, and higher up are the colleges and universities, but museums include among their attending students the toddling infant, and the grey-haired patriarch.

Let us consider some few of the things which great museums have to teach us. One of the newest as well as one of the greatest of the museums on this continent, is the American Museum of Natural History, situated in New York City. Its exhibits are multitudinous and truly impressive. Who can view understandingly the wonderful mounted specimens of the reptilean monsters of the dim geologic past, without having a broader, more profound, more accurate view of the brief moment of time in which we live? Who can stand before those creations of art, the background bird groups, without having a better understanding and appreciation of the beauties of our bird life in its natural setting? Such work is as truly the work of the artist, as are paintings and statues! The wonderful array of minerals and the priceless collections of gems and precious stones illustrate the best that the rocks have to reveal. As wanderers from outer space, there are to be seen some of the largest meteorites known. Among them are included Peary's wonderful specimens from Greenland, one of which is as large as an explorer's tent.

And what of the National Museum at Washington? Few will fail to recall the wonderful groups of American aboriginies, transfixed as it were near their habitations in the midst of their daily tasks, with their implements, and food supplies nearby; nor can the fine groups of African game animals be forgotten, including rhinoceros, buffaloes and lions, collected by Colonel Theodore Roosevelt.

From the Field Museum of Natural History, Chicago, the visitor carries away a better understanding and clearer picture of African antelope, hyenas, zebras and leopards in their natural habitat than pages of descriptive writing could have given.

The Milwaukee Public Museum takes the visitor back to the days of early colonial life in America, and depicts a street scene, say in Massachusetts, with small frame houses, homemade furniture, dove cotes, and people dressed in simple homespun. Fine groups of mammals and birds and many other exhibits are there, but the colonial village is unique.

The New York State Museum at Albany illustrates in wonderfully realistic form, the early fish-like creatures of the geologic past, and one of the earliest trees known from fossil remains. The Iroquois indian groups, prepared from indian models, under the direction of a Mohawk Indian, perpetuate the memories of Indian life as it was when Champlain was founding Canada.

And there are other great museums at Pittsburg, Brooklyn, Boston, Philadelphia, and elsewhere, all teaching their lessons to the visitor. Volumes could be written descriptive of them, each writer depicting those exhibits which appeal to him most.

It must not, however, be supposed that the public exhibits make up the entire museum, nor that all specimens are placed on exhibit. Great as is the popular educative value of exhibits, many specimens must also be preserved for comparison and study by specialists and research students. Zoological specimens generally fade when placed on exhibit, and groups of mammals, birds and insects have to be replaced by new material from time to time. So it happens that for every specimen on exhibit hundreds or in many cases thousands of valuable specimens may be carefully stored away, where they are available for study, or to replace other exhibits.

Besides the exhibitions and the special researches carried on by modern museums, lecture halls are provided, where members of the staff lecture to students from schools and colleges and to the public in general.

So far reference has been made to the museums of the United States only; let us now turn to the museums of Canada. Among these are the provincial Museum of British Columbia, at Victoria, the Banff Park Museum, the Redpath Museum of Natural History at McGill University, Montreal, the Museum of the Natural History Society of New Brunswick at St. John, the Royal Ontario Museum at Toronto, and the Geological Survey Museum housed in the Victoria Memorial Museum at Ottawa.

The British Columbia Museum is particularly mentioned by visitors because it contains a complete collection of the game animals of the province. The Banff Museum appeals to tourists because of its

game exhibits. The Redpath Museum contains a variety of collections, dating back over many years, and is a storehouse of valuable study material for McGill University. The Museum of the Natural History Society of New Brunswick, at St. John, emphasizes the direct instruction side of museum work, and, although possessed of limited resources, with the co-operation of the railways, places timely exhibits before the people by means of museum cars.

The Royal Ontario Museum at Toronto has, within the last six or seven years, assumed the leading position in Canada on account of its exhibits. It contains a number of very interesting features, among which are its collections of oriental arms and armor, its antique furniture and musical instruments and its well arranged collections of minerals and invertebrate fossils.

Our national institution, the Geological Survey Museum housed in the Victoria Memorial Museum at Ottawa, contains the exhibits long housed on Sussex street, including all the collections made by the Geological Survey since its founding by Sir William Logan in 1842. The collections of indian clothing, weapons, works of art, and utensils are very complete and fine, and could not be replaced. The herbarium represents collections from all parts of the country. The zoological collections contain specimens of most of the species of the vertebrate fauna of Canada and in some lines it is very complete. About 13,000 bird skins are catalogued and carefully stored for study, and the game and fur-bearing mammals are represented by many specimens.

It is in palæontology, however, that the Geological Survey Museum ranks especially high. All the type specimens described by the noted Canadian palæontologists, Elkanah Billings and J. F. Whiteaves (that is the specimens which were first studied and upon which the species were founded) are contained in the invertebrate collection, along with the types of more recent workers, and thousands of valuable specimens gathered from all parts of Canada during 75 years of exploration. In vertebrate palæontology, many fine specimens represent the huge creatures of past geologic ages, and the Cretaceous dinosaurs from the Red Deer Valley of Alberta form a collection second only to that of the American Museum of Natural History, New York. These were obtained during the past six years by the veteran collector, Charles H. Sternberg and his sons, and were being described by the late Lawrence M. Lambe.

There are also the ores and minerals of Canada, of which we may be justly proud. Specimens have been collected from all parts of the country and a very good display of these is now being placed on exhibit in the economic museum of the Geological Survey, at 227 Sparks street.

It is not to be supposed, however, that because of the collections already made, that nothing is left to be done. A museum must be a growing concern like all other institutions that possess life and a future. Dr. W. T. Hornaday has said that the British Museum surpasses all other museums because a devoted nation has for generations collected trophies and specimens for it from all corners of the earth. It remains for Canadians to give their Museum such support that it may be made and kept, an object of sustained national pride.

Specialists have been appointed to take charge of the various divisions of natural history and a fair start had been made in arranging public exhibits when the Parliament Buildings were burned. The Museum building was needed for Parliament and all museum material had to be hurriedly packed and stored. Thus, so far as the public is concerned there has been no National Museum for the past three years. The preparation of exhibits has continued but has been much curtailed by lack of space. Plans are ready however for placing many fine exhibits in the halls as soon as the building is once more made available for museum purposes.

Let us picture to ourselves what the museum may some day be like. The Ethnological hall is intact and with its wealth of aboriginal material may be reopened on short notice. The hall of fossil vertebrates may be quickly rearranged, so as to display its huge reptilian monsters, early mammals, birds, and fishes—altogether a suggestive chapter of the geologic past. The wonderful collection of fossil shell fish and other inhabitants of the early seas when arranged according to formations and biologic groups will be one of the best assemblages of its kind in America. The contemplated bird group, representing the avifauna of southwestern Ontario (the extreme southern tip of Canada), should fascinate all bird lovers. Musk ox, moose, polar bear, beaver and other groups of our big game and fur bearing mammals are planned and some are partly executed. These with scenic backgrounds and natural accessories, should be a source of education and delight to all lovers of nature, and to sportsmen especially. For the miner and mineralogist there will be systematic collections of minerals and rocks, models of mining camps, and maps and plans of mines. For the botanist there is the herbarium, for the entomologist the insect collections and so on.

In short, with the specialists who are in charge and with the nucleus of a great collection already on hand, effective, popular support expressed through Parliament is all that is needed to make our museum in the near future something to be proud of, an educational institution, teaching effectively all branches of the natural history of Canada.

THE BIRDS OF SHOAL LAKE, MANITOBA.

By P. A. Taverner.

(Continued from page 164 of The Ottawa Naturalist, Vol. XXXII.)

103. *Black-billed cuckoo, *Coccyzus erythrophthalmus.*

Job reports seeing this species on the western side of the lake on June 27 to 30, 1912. We saw none in 1917 though we heard rumors of cuckoos having nested in the vicinity. In 1918 the Black-bill appeared on June 14, after which Young noted a few birds almost daily to August 1.

104. Belted kingfisher, *Ceryle alcyon.*

Strangely enough, on the borders of such a fine lake we saw no kingfishers in 1917, though Young reports one on May 2, 1918. The Ward brothers say that in previous years there were always a few about, and Seton reports a specimen taken by Miller Christy on May 15, 1887. The only explanation of their present absence seems to be the lack of fish caused by the extreme akalinity of the lake at its present level.

105. *Hairy woodpecker, *Dryobates villosus.*

Rather rare. Only two seen during the spring visit and one in September of 1917. Young noted the species, in 1918, in limited numbers, from June 3 to Sept. 26, taking juveniles but recently from nest, so it doubtless breeds in the vicinity. Five of our specimens are clearly referable to *D. v. leucomelas* though one, Sept. 22, 1917, falls slightly short of *leucomelas* measurements.

106. *Downy woodpecker, *Dryobates pubescens.*

Several seen during the spring of 1917, but none in the autumn. Observed by Young in 1918 in small numbers from May 3 to Sept. 12.

107. *Yellow-bellied sapsucker, *Syphrapicus varius.*

Next to the Flicker the commonest woodpecker. Several nests were found and the species was still present during the fall visit in 1917 and to the end of September, 1918.

108. Red-headed woodpecker, *Melanerpes erythrocephalus.*

Though we have no substantiating evidence, the Ward brothers declare that they have seen one or two individuals. There should be but little mistake with such a showy and strongly marked species.

109. *Flicker, *Colaptes auratus.*

Very common and breeding. Still present in 1918 to date of leaving Oct. 2. Young says that through September they were very busy feeding on ant hills.

110. *Nighthawk, *Chordeiles virginianus.*

Very common in 1917. First arrival May 18. One seen on Sept. 17, but none thereafter that year. The specimens taken seem to be *virginianus.* One is nearly light enough to be regarded as *hesperis* but as it can be matched by individuals from New Brunswick and central Ontario, I hesitate to so identify it.

111. *Ruby-throated hummingbird, *Archilochus colubris.*

Quite common throughout the spring visit of 1918 and noted by Young occasionally in 1918 from June 1 to end of August.

112. *Whip-poor-will, *Antrostomus vociferous.*

Heard in 1917 nearly every night during the spring visit and once in the autumn, on Sept. 17. Young only observed it once on June 6 in 1918, but his difficulty in hearing would prevent his noting it very often.

113. *Kingbird, *Tyrannus tyrannus.*

First seen in 1918 on May 18; very common by the 29th. On Sept. 18 a flock of six were seen. Common in 1918 from May 17 to Sept. 10.

114. *Phoebe, *Sayornis phoebe.*

One taken by Young, on Aug. 30, 1918, is our only record.

115. *Crested flycatcher, *Myiarchus crinitus.*

In 1917 only one was seen, June 1. In 1918, Young noted it twice in early June, three times in July, and once in September. The Ward brothers say that in 1916 Frank McGiffon took a set of eggs locally.

116. Olive-sided flycatcher, *Nutallornis borealis.*

In 1917 one reported on June 5 and one taken on the 14th. In 1918 Young noted several on June 4 to 9, and again a single bird on Aug. 17.

117. *Wood pewee, *Myiochanes virens.*

Our only record for this species consists of two specimens taken by Young on June 18 and July 2, 1918. The former is a female and had an egg ready to lay, thus verifying the species as a breeder in the locality.

118. *Yellow-bellied flycatcher, *Empidonax flaviventris.*

One taken on Maple Island above the Narrows on May 30, 1917. As sight records unsupported by the ear are unsatisfactory in regard to the smaller flycatchers, citing the specimens taken by Young in 1918 is probably the better way of reporting his experience. He took specimens of this species on June 4 and Aug. 15.

119. *TRAILL'S FLYCATCHER, *Empidonax trailli.*

First seen on May 9, becoming almost common by the 14th. In 1918 Young took one on June 8. All specimens are referable to the Alder Flycatcher, *E. t. alnorum.*

120. *LEAST FLYCATCHER, *Empidonax minimus.*

In 1917 first seen on May 23. By the 30th they were common in all the bluffs. Young's experience in 1918 seems about similar. He took specimens from May 30 to July 31.

121. *HORNED LARK, *Otocoris alpestris.*

In 1917 very common during the spring visit, but only a few present in the autumn. In 1918, Young found them consistently common throughout his stay from late April to early October. On April 24 he found a large flock (100) in company with Lapland Longspurs. He obtained one specimen from it, a well-marked *O. a. alpestris.* All other birds taken are *O. a. praticola.* It is worth while noting, as a caution against taking assumed breeding dates as evidence of nesting, that only six days after the taking of the above evident migrant *alpestris* nearly fully fledged young of *praticola* were collected. Thus local birds had young out of the nest before more northern nesters had left for their breeding grounds.

122 MAGPIE, *Pica pica.*

The Ward brothers say that the Magpie occasionally occurs about Shoal Lake. They recall one seen in July and two in June, 1904. May 21, 1918, William Ward reported seeing one near camp, and a few days later Frank Ward had exceptional opportunities of watching another at Gimli on the shores of Lake Winnipeg, some forty miles east of us.

123. BLUE JAY, *Cyanocitta cristata.*

In 1917 fairly common in spring but not noted during the autumn visit. In 1918 Young noted the species until Sept. 28.

124. CANADA JAY, *Perisoreus canadensis.*

Said by the Ward brothers to be a winter visitor, coming sometimes as early as September, but less numerous of late years.

125. RAVEN, *Corvus corax.*

Said by the Ward brothers to be fairly common during hard winters.

126. *AMERICAN CROW, *Corvus brachyrhynchos.*

Very abundant. Residents do not complain much of its destructiveness to crops but it is certainly a great nest robber and its effects upon the ducks must be marked and serious. Amongst Young's specimens are two that he concluded from their actions to be mated, but, while the male is large even for *C. b. brachyrhynchos*, the female falls well within the measurements for *C. b. hespris.* Considering other Canadian prairie specimens with these, I do not consider the two races satisfactorily differentiated.

127. *BOBOLINK, *Dolichonyx oryzivorus.*

In 1917 a few were seen on wet meadows in the spring, none in the autumn. In 1918 Young noted them from June 8 to Aug. 22. The residents say that occasionally they do some damage to grain.

128. *COWBIRD, *Molothurus ater.*

Very abundant. Noted by Young in 1918 to Sept. 7.

129. *YELLOW-HEADED BLACKBIRD, *Xanthocephalus xanthocephalus.*

The least common of the resident blackbirds. Occasional small flocks were found foraging here and there on the uplands, cultivated fields and dry marshes. In 1918 still scarcer than during the preceding season. It seems that this bird requires more extensive marshes than the Red-wing. In 1917 we found resident colonies in a few places while the Red-wings occupied every reedy slough. Young reports no breeding birds in 1918. His latest record for the species is Aug. 26. The juveniles in first winter plumage are quite similar to the adults but the white primary coverts are reduced to traces and the crown and hind neck concolorous with the back. In one specimen, a stripped plumage, similar to that of the juvenile Red-wing is just disappearing on the breast where it is being replaced with yellow of rather a deeper orange than that of the adult.

130. *RED-WINGED BLACKBIRD, *Agelanius phoeniceus.*

Very abundant, breeding in every suitable locality.

The A. O. U. Check List recognizes the Red-winged Blackbird of central North America as the Thick-billed Red-wing, *A. p. fortis.* This race Mr. H. C. Oberholser (*Auk* XXIV, 1907, pp. 332-336) further divides into northern and southern forms, calling the Canadian race *A. p. arctolegus*, extending its range east to Isle Royal, Lake Superior, and restricting *fortis* to the United States, south from Nebraska. As the A.O.U. Committee has not as yet recognized *arctolegus*, from the standpoint of the Check List, it can be regarded as a synonym of *fortis.* The diagnosis for *fortis* calls for a larger bird than *phoenicus*, the eastern race, with a comparatively shorter, thicker bill. *Arctolegus* is characterized by its describer as a large *phoeniceus* with slight color differences in the female.

To obtain easily compared factors of shape and size, I have divided the length of the bill by the depth for an index of shape and multiplied them together for an index of size. The former gives the length in units of depth, and the latter a product that whilst more or less arbitrary in itself, when derived from specimens of the same species, should be strictly comparable with each other and representative of relative size, irrespective of the disturbing element of shape.

Comparing Shoal Lake birds with other material, I have made use of the following adult male material: 9 from Mass., southern Ont. and southern Mich.; 7 from Shoal Lake and two from Douglas, Man.; and 7 from Sask., Alta., and Mack. The measurements of these birds together with those similarly derived from Mr. Oberholser's paper above cited, tabulate as follows:

	Index shape.	Index size.	Wing average.	Wing Min. & Max.
9. Eastern Canada	1.9	245.1	121.7	(116.0-128.0)
7. Manitoba	1.96	264.4	124.4	(120.5-128.0)
7. Sask., Alta., Mack	1.8	229.2	127.2	(111.5-132.5)
10. phoeniceus (H.C.O.)	1.8	269.2	118.8	(114.0-122.0)
12. arctolegus (H.C.O.)	1.88	304.8	125.4	(121.5-130.0)
11. fortis (H.C.O.)	1.88	254.04	129.7	(125.0-134.0)

In color, I find Shoal Lake females showing a slightly greater amount of white below, most distinctly on the throat and upper breast, but the distinction is too slight and inconsistent for certain or individual recognition.

It will be seen that the difference in shape of the bills of these various strains is very slight, and in no case marked enough to warrant the title "Thick-billed", in fact Oberholser's *arctolegus* and *fortis* have more slender bills than *phoeniceus*, and the Shoal Lake specimens considerably exceed all others in this direction having minimum and maximum indices of 1.72 and 2.22.

It is also evident that whilst there is a slight increase in size of both bill and wing of this species westward over the prairie provinces, the difference is not so marked in the new material as in Oberholser's measurements: also that individual variation is almost as great as the racial distinction and is one of averages, leaving the bulk of individual specimens subspecifically unrecognizable by character. Such distinctions do not in the view of the writer form criteria sufficient for systematic separation and nomenclature. Irrespective of such judgment on the races concerned it is evident that these Shoal Lake birds are just about intermediate between eastern and west plains birds though personally I do not care to separate them from *phoeniceus*.

131. *WESTERN MEADOW LARK, *Sternella neglecta.*

Very common during all visits. The song of the Western Meadow Lark is justly noted. It is one of the most wonderful prairie sounds and its constant repetition and infinite variety is characteristic of the west. However, eastern ears may be pardoned for a little disappointment on first hearing it. If they expect to hear a glorified eastern Meadow Lark song they certainly will be disappointed. While it is a beautiful production it is not the song they have been accustomed to associate with the coming of spring. It has many charms of its own, but they are not familiar; in fact hardly a note suggests the well remembered voice of the old eastern friend and until its source is traced, even an experienced ornithologist is apt to wonder as to the identity of the singer. It will, I think, take several seasons' experience with this species to build up a new set of associations and take it to the heart in place of the well beloved eastern harbinger of spring.

132. *BALTIMORE ORIOLE, *Icterus galbula.*

In 1917, arrived on May 23, common on June 2; not seen in the autumn. In 1918, arrived on May 16, the bulk disappeared on July 23, and the last one was seen on Aug. 6.

133. *RUSTY BLACKBIRD, *Euphagus carolinus.*

Not recognized in spring, but one was noted on Sept. 21, 1917; not recorded by Young in 1918.

134. *BREWER'S BLACKBIRD, *Euphagus cyanocephalus.*

Very amundant and nesting in nearly every open bluff. They follow the ploughman about his work gleaning from the newly turned furrow, and associate commonly with the sheep perching upon their backs and scrutinizing the fleece, probably for ticks. On Sept. 25, 1917, three were taken from a flock. Of these one female, seemingly an adult by its completely granulated skull, had the iris reddish-brown just flecked with straw. All other specimens taken had the usual straw-colored iris.

135. *BRONZE GRACKLE, *Quisculus quiscula.*

In 1917 there was a thriving colony of Bronzed Grackles nesting in the willows just behind the Ward house until persevering work with a shot gun removed them, after which many more attractive birds of less questionable character were able to appropriate the premises. The Wards accuse them of doing considerable damage by killing young chicks. While I cannot substantiate this charge I have little doubt as to its truth. None were seen in the autumn of 1917, but Young noted the species as late as Sept. 27, in 1918.

136. *EVENING GROSBEAK, *Hesperiphona vespertina.*

In 1917 we saw two to four individuals, May 20, 24 and 25, and secured several specimens. I noted that the bills of these were as green as those of summer birds from British Columbia and quite different from the yellow mandibles of eastern mid-winter specimens. The difference is probably seasonal rather than subspecific. Unfortunately these are amongst the birds that were lost. In 1918, Young noted three and two Sept. 25 and 30.

137. *PURPLE FINCH, *Carpodacus purpureus.*

None noted during either spring. Two or three were seen on several days in a small growth of hawthorn in September. In 1918, Young noted small numbers from July 11 to Aug. 26, and a single individual on Sept. 25.

138. *GOLDFINCH, *Astragalinus tristis.*

None seen in spring until May 27, 1917, after which they became common and were still numerous in September. Young noted them in 1917 from April 29 to his departure on Oct. 2.

139. *PINE SISKIN, *Spinus pinus.*

In 1918 Young noted 5 on June 5, 2 on the 21st, and one Sept. 24, taking specimens on the first two occasions.

140. *SNOW BUNTING, *Plectrophenax nivalis.*

In 1918, Young found large flocks on his arrival on April 24, and saw them almost daily until May 24. After this, 5 were noted on the 22nd and one on the 28th. Specimens taken on April 21 and May 2 are in high breeding plumage.

141. *LAPLAND LONGSPUR, *Calcarius lapponicus.*

A few seen between May 22 and 25. Very abundant in the autumn, occurring in large flocks in the long grass of the old marshes and on the lake shore. In 1918, Young found large flocks on April 24, but the bulk of the species left after the 30th. One straggler was taken on June 4. In the autumn the flocks of the previous year were absent and he noted but one individual on Sept. 23.

142. *CHESTNUT-COLLARED LONGSPUR, *Calcarius ornatus.*

A single bird secured on June 6, 1917, and a flock of seven noted on the 9th. It was not seen by Young in 1918. Seton has a specimen taken by Miller Christy in May, 1887, but the Ward brothers are not familiar with it, and it is doubtless rather rare in the locality or very local in distribution.

143. *VESPER SPARROW, *Poocaetes gramineus.*

Strangely absent both springs in the vicinity of the lake though from the train one was seen a few miles south of Erinview. In the autumn of both years they were seen about the Ward house in limited numbers between Aug. 23 and Sept. 28. These birds are rather large for the eastern race, and though in rather indeterminate juvenile plumage can probably be referred to the western race *P. g. confinis.*

144. *SAVANNA SPARROW, *Passerculus sandwichensis.*

Very common indeed during all visits. The local breeding birds show the bright yellow eye-brow common to the birds of the prairie provinces, and certainly do not agree with the described characters of *P. s. alaudinus* and at present seem without a name. The autumn birds are slightly darker than *savanna* and are both with and without the yellow loral spot. I suspect that both a resident and a migrant form are represented, but I do not care to refer them to any sub-species generally accepted at present.

145. BAIRD'S SPARROW, *Ammodramus bairdii.*

Though reported by Chapman as very common at Shoal Lake and by Seton as common and breeding, the species was carefully searched for both seasons without success. Undoubtedly it has departed from the country with the lowering of the lake level and the disappearance of the broad marshes.

146. *LECONTE'S SPARROW, *Passerherbulus lecontei.*

Scattered individuals were met with both seasons in widely separated localities both in spring and in autumn.

147. *NELSON'S SPARROW, *Passerherbulus nelsoni.*

The western form, the Prairie Sharp-tailed Sparrow, *P. n. nelsoni* was met with in scattered individuals in various parts of the surrounding country as late as September 25. The juvenile plumage is quite different from that of the adult and might well be taken for a different species. All strong ochre, slightly paler below and only broken by restricted fuscous centres of secondaries and wing coverts which become fainter and almost concealed across the back, a double crown stripe and a faint bar back from the eye. The outer web of the first primary is edged with clear cream and the tail is ochraceous-fuscous with dark shaft. One specimen shows adult plumage appearing in the juvenile dress indicating that full plumage is assumed the first winter.

148. *HARRIS'S SPARROW, *Zonotrichia querula.*

Very common on our first arrival in 1917. Most of them left about May 28, though a couple of individuals remained to the end of our stay. Frank Ward reported seeing one carrying nesting material from his chip-yard towards the nearby bluff and suspected that they were nesting in the locality. The same authority tells us that some years ago he found a nest of this species on the ground in the shelter of an old log. On the return visit the same autumn they were common again in their old spring haunts and I was informed that individuals had been noted regularly through the summer. With this possibility of finding breeding birds, Young watched carefully for them during the summer of 1918, but between May 28 and Sept. 14 none were noted. They returned on Sept. 14 and were still present when he left on Oct. 2. The most peculiar thing about these autumn birds was the unusual abundance of adults in comparison to juveniles. Of perhaps fifty birds seen but three or four were juvenile either by plumage or cranial characters. This is unusual enough amongst autumn birds to justify special mention, as usually juveniles greatly outnumber adults.

149. *WHITE-CROWNED SPARROW, *Zonotrichia leucophrys.*

In 1917, single individuals seen on May 15 but

common throughout the autumn stay. In 1918, present in limited numbers from May 6 to May 23 and rather more numerous Sept. 17 to 30. Of those in adult plumage, two males (May 13, 1918 and Sept. 20, 1917) have the white loral line continuous to bill and can therefore be ascribed to *Z. l. gambeli.* The other has it faintly interrupted across the lores and must therefore be regarded as intermediate between *Z. l. leucophrys* and *gambeli.*

150. WHITE-THROATED SPARROW, *Zonotrichia albicollis.*

Common both spring and autumn. In 1918, absent from May 27 to Sept. 8, except four individuals seen on July 24. Great numbers seen Sept. 19-27, but still present when Young departed on Oct. 2.

151. *TREE SPARROW, *Spizella monticola.*

Not noted in 1917. In 1918 observed from April 26 to May 4, and again on Oct. 1 and 2. One specimen, female, April 30, I refer to *S. m. monticola.*

152. *CHIPPING SPARROW, *Spizella passerina.*

Very common in the spring of 1917. To the end of May flocks of a hundred or more were met. In the autumn the species was not certainly identified though the first day of arrival I thought I recognized them amongst the hordes of clay-colored sparrows. In 1918, Young noted a few on May 4 and 8. From the 16th to 27th it was present in flocks of from 50 to 100. The species departed on June 8 and no more were seen except 3 on July 23.

153. *CLAY-COLORED SPARROW, *Spizella pallida.*

Very common in spring and autumn. In 1917, they seemed to leave on Sept. 21, but in 1918, Young noted them to the date of leaving on Oct. 2.

154. *SLATE-COLORED JUNCO, *Junco hyemalis.*

In 1917, but one specimen seen in the spring but fairly common in the autumn. In 1918, Young noted it from April 24 to May 15 and from Sept. 6 to Oct. 2.

155. *SONG SPARROW, *Melospiza melodia.*

Common in spring and autumn of both years. In 1918, present on arrival, April 24, and when leaving, Oct. 2. Specimens taken between May 13 and July 31, probably breeding birds are the slightly lighter form, with more distinct markings, than eastern *M. m. melodia* and I refer them to *M. m. juddi.*

156. *LINCOLN'S SPARROW, *Melospiza lincolni.*

In 1917, single individuals seen and taken on May 19 and June 1. In the autumn seen nearly daily in limited numbers. Noted in limited numbers by Young in 1918 from May 11 to 25 and more commonly from Aug 3 to Oct. 1.

157. *SWAMP SPARROW, *Melospiza georgiana.*

Seen in small numbers in the spring of 1917 and more commonly in the autumn. In 1918, Young noted it from May 4 to 30 and again Aug. 21 to Oct. 2. Strangely enough but one bird was seen in the summer, June 10, which seems to indicate that the species does not breed in the locality.

158. *FOX SPARROW, *Passerella iliaca.*

One specimen taken Sept. 22 is all that was seen in 1917. In 1918, Young noted single individuals on Sept. 16, 24 and 30, and a flock of 30 on the 25th.

159. *TOWHEE, *Pipilo erythropthalmus.*

In 1917, fairly common in the spring and still present Sept. 19 and 21. In 1918, Young saw a few individuals with general regularity from May 24 to July 29. A single bird, Aug. 13, and another Sept. 19.

160. *ROSE-BREASTED GROSBEAK, *Zamelodia ludoviciana.*

Fairly common during the spring visit in 1917. In 1918 observed irregularly from May 16 to Aug. 5.

161. *PURPLE MARTIN, *Progne subis.*

A few seen daily in 1917, probably the same ones. A few occupied a box near an adjoining summer cottage and another colony was found nesting according to aboriginal habit in a hollow tree a few miles from camp. In 1918, noted by Young from May 17 to Sept. 20.

162. *CLIFF SWALLOW, *Petrochelidon lunifrons.*

In 1917 a few seen daily with the flocks of Barn Swallows about camp and occasional birds elsewhere. Seton noted twenty-five nests on a barn in 1891. In 1918, noted from May 24 to Sept. 17.

163. *BARN SWALLOW, *Hirundo erythrogaster.*

Small colonies occupy most of the farm building groups in the neighborhood. In the autumn of 1917 this was the only swallow seen. In the chilly mornings a small flock of them would be found warming themselves on the sunny roof of the house where the frost was melting. As soon as the day warmed they disappeared over the meadows and rarely returned until the next morning. The last seen were on Sept. 21. In 1918, they remained common until Sept. 20.

164. *TREE SWALLOW, *Iridoprocne bicolor.*

In 1917, only a few seen each day in spring and none in the autumn. In 1918, they remained common until Aug. 21, but a few were seen thereafter until Sept. 17.

165. *BANK SWALLOW, *Riparia riparia.*

A few observed daily in the spring of 1917. The Ward brothers say that one stage of the lake left numerous steep banks five to six feet high and that swallows nested in these in great numbers. Now

these banks are far removed from the water, cut down by cattle and sheep, and are deserted by the birds. We saw no nesting places in the vicinity. Young noted it in 1918 only in autumn, arriving on Aug. 17, and seen in small numbers irregularly until Sept. 12.

166. *CEDAR WAXWING, *Bombycilla cedrorum.*

In 1917, a flock of a hundred or so seen on May 11 and smaller lots daily thereafter through the spring visit but not noted in the autumn. In 1918, the species was first seen on June 4th and irregularly observed until Sept. 26.

167. *LOGGERHEAD SHRIKE, *Lanius ludovicianus.*

In the spring of 1917 we found two breeding pairs and a single individual. I can find little foundation for Ridgeway's color distinction, "decidedly paler" of the White-rumped Shrike, *L. l. exubitorides*. Prairie birds are very slightly paler than *L. m. migrans* from eastern Ontario. The difference can only be observed by the closest comparison. In the four specimens taken at Shoal Lake the rumps are intermediate between that of eastern birds and *excubitorides* from Alberta. I, therefore, regard them as intermediates between these rather poorly defined races.

168. *RED-EYED VIREO, *Vireosylva olivacea.*

In 1917, not seen until May 30 after which occasional birds were noted. Not seen that autumn. In 1918, Young noted the species continuously, in fair numbers from May 17 to Sept. 16.

169. *PHILADELPHIA VIREO, *Vireosylva philadelphia.*

Not noted by us in 1917, but Seton has a specimen in his collection taken at Shoal Lake by Miller Christy on May 20, 1887; Young collected specimens on the following dates in 1918, May 21 and 24, June 1 and Sept. 24.

170. *WARBLING VIREO, *Vireosylva gilva.*

In 1917, quite common after May 28. In 1918, Young found it constantly present in fair numbers from May 20 to Sept. 26. All specimens are *V. g. gilva.*

171. *SOLITARY VIREO, *Lanivireo solitrius.*

Not noted by us in 1917, but seen by Young in 1918 from May 10 to 20 and Sept. 2 to 16.

172. *BLACK AND WHITE WARBLER, *Minotilta varia.*

In 1917, occasional individuals seen after May 30 in spring and one on Sept. 19. In 1918, Young noted it with fair regularity, but scarcer in July, from May 8 to Sept. 26. It probably breeds.

173. *NASHVILLE WARBLER, *Vermivora rubricapilla.*

Not noted in 1917 but reported by Young in 1918 to be very common in May and September. Noted May 18 to June 20 and Sept. 2 to 26 with occasional individuals through July.

174. *ORANGE-CROWNED WARBLER, *Vermivora celata.*

In 1917, seen the first two days of our spring visit and on Sept. 19. In 1918, Young noted it only from May 17 to 24. In specimens obtained the yellow is slightly lighter than in comparable eastern species, but as this is probably due to the cleaner and better condition and make up of the skins, I regard them as *V. c. celata*, the geographical probability.

175. *TENNESSEE WARBLER, *Vermivora peregrina.*

Not noted in 1917, but reported by Young in 1918 to be very common in May and September. Noted May 18 to June 24 and Sept. 2 to 26 with occasional individuals through July.

176. *CAPE MAY WARBLER, *Dendrioca tigrina.*

Two taken at Maple Island on May 30, 1917, and noted by Young on May 21 to 24, 1918.

177. *YELLOW WARBLER, *Dendroica aestiva.*

In 1917, a few present on our arrival on May 17 but common after June 1. In 1918, common from May 8 to Sept. 16. Compared with the writer's experience with this species in southern Ontario this is a very late stay for the species as in the Lake Erie neighborhood Yellow Warblers are rarely seen after Sept. 1.

178. *MYRTLE WARBLER, *Dendroica coronata.*

In 1917, the commonest Warbler on both visits. In spring it disappeared about June 1, after which but occasional individuals were seen.

179. *MAGNOLIA WARBLER, *Dendroica magnolia.*

In 1917, rather scarce in spring. In 1918, on the contrary, Young found it quite common from May 16 to the 27th and in the late autumn from Sept. 2 to 28.

180. *CHESTNUT-SIDED WARBLER, *Dendroica pensylvanica.*

Individuals seen June 4 and 5 and on Sept. 17. Not seen by Young in 1918.

181. *BAY-BREASTED WARBLER, *Dendroica castanea.*

In 1917, only seen on June 2 and 6. In 1918, only noted on Sept. 6 to 12.

182. *BLACK-POLLED WARBLER, *Dendroica striata.*

In 1917, first seen on May 30. Quite common on June 2, and but occasional individuals thereafter. One seen on Sept. 17.

183. *BLACKBURNIAN WARBLER, *Dendroica fusca.*

One taken by Young on May 16, 1918, is our only record.

184. *BLACK-THROATED GREEN WARBLER, *Dendroica virens.*

Individuals seen by Young on May 24 and Sept. 4, a specimen being taken on the latter date. He also reports the remains of another impaled by shrikes without giving date.

185. *PALM WARBLER, *Dendroica palmarum.*

In 1917, present in limited numbers on our arrival but none seen after May 25. Several seen between Sept. 19 and 22. In 1918, noted by Young from May 8 to 30 and Sept. 6 to Oct. 2, the date of departure.

186. *OVENBIRD, *Seiurus aurocapillus.*

In 1917, a few single individuals were heard and seen in the deeper woods from May 29 on. Before leaving they become slightly more common. In 1918, noted by Young from May 21 to June 3, one individual in July, and then again from Sept. 2 to 14. This is a retiring species and oftener recognized by ear than sight. Its absence through June, July and August is probably more apparent than real.

187. *NORTHERN WATER THRUSH, *Seiurus noveboracensis.*

In 1917, two water thrushes were seen, perhaps an original pair, May 18 and June 2, in the dry willow grown creek bed by the Ward house. On Sept. 19 another was noted in the same locality. In 1918, the species was noted with daily regularity from May 10 to 25 and Sept. 4 to 26, with a single individual on Aug. 22. The specimens are in a very mixed lot of plumages, and one a male, Sept. 12, is nearly as white below as a Louisiana Water Thrush, *S. motacilla;* two other specimens are nearer the eastern one *S. n. noveboracensis* than *S. n. notabilis.* Three others while yellower below and blacker above and characteristic *notabilis* are quite comparable with some New Brunswick birds. I find that Grinnell's Water Thrush rests upon very inconstant characters.

188. *CONNECTICUT WARBLER, *Oporornis agilis.*

On June 4, 1917, one bird was seen under excellent conditions for determination, when shot it fell far away in heavy brush and could not be found. One juvenile was taken by Young on Sept. 16.

189. *MOURNING WARBLER, *Oporornis philadelphia.*

Several times in the spring of 1917 I thought I heard this bird in a slashing in the oak patch in the big bluff behind the camp. It kept so close to a limited locality that I have no doubt that it was nesting nearby. It was absolutely identified June 14 when secured. In 1918, the species was noted by Young from May 30 to June 8 and one was taken Sept. 7. Specimens of this species in fall plumage are rather scarce in collections as it usually drifts through very inconspicuously early in the autumn.

190. *MARYLAND YELLOWTHROAT, *Geothlypis trichas.*

Quite common after June 2. In the autumn individuals were seen Sept. 21 and 22. The species obtained are referable to *G. t. occidentalis,* the Western Yellow Throat. The backs are faintly lighter than eastern and intermediate between them and individuals from Indian Head and Edmonton, but the white foreheads are decidedly more extensive than in eastern species.

191. *WILSON'S WARBLER, *Wilsonia pusilla.*

Only seen in 1918 on May 18. In 1918, Young observed the species on May 16, 18 and 24.

192. *CANADIAN WARBLER, *Wilsonia canadensis.*

One taken on June 6, 1917, and noted by Young on May 24 and June 4.

193. *REDSTART, *Setophaga ruticilla.*

Not seen in 1917 until May 29, but common thereafter. In 1918, Young observed it from May 18 to June 8 and from Aug. 26 to Sept. 27. He did not note it through the summer.

194. *AMERICAN PIPIT, *Anthus rubescens.*

In 1918 fairly common during the early days of our spring visit along the lake shore, but none seen after May 30. Abundant in the fall occurring in large flocks, scattered bunches and individuals on all bare ground. In 1918, noted by Young on May 13 and 27 and Sept. 14 to date of departure Oct. 2.

195. *SPRAGUE'S PIPIT, *Anthus spraguei.*

Between June 5 and 9, 1917, I was much puzzled by an oft repeated and haunting bird song that could be barely heard and which I was unable to locate or recognize. It was a fine silvery gradually descending Ree-ree-ree-a-ree-a-ree-a-aree-aree of about eight notes, and an octave in range. It had a peculiar ringing jingle like the Veery but more sustained and regular. After innumerable futile attempts at discovering the singer at last I found it high over head flying about in circles for minutes at a time. It beat its wings vigorously against the slight breeze, making altitude rather than headway, and then the song came down. After the first two or three syllables reached the ground the wings fixed and the bird would sail in a downward spiral through the remainder of the song. This was repeated time and time again. It took considerable patience to watch the little vocalist until it came down to earth by an almost straight dive. Though nearly out of sight in the air the speed with which it dropped and the distance away at which it alighted indicated that it was originally up no more than a hundred yards or so while singing. Thereafter we could hear this song nearly the whole of every fine day, but this was the only bird of the species that we met. In 1918, Young reports the species occasionally throughout the summer from June 21 to Sept. 7.

196. *CATBIRD, *Dumatella carolinensis.*

Common, found in nearly every bluff. In 1918, Young noted it almost daily from May 20 to Sept. 11.

197. *BROWN THRASHER, *Toxostoma rufum.*

Fairly common. At least two pairs lived within hearing of our camp in 1917 and we met with half a dozen more on our spring rambles. In 1918, Young noted it constantly from May 16 to Aug. 24 with a couple of late individuals on Sept. 12 and 17.

198. *HOUSE WREN, *Troglodytes aedon.*

Very abundant and heard singing everywhere. They do not seem as inclined to build about the farm buildings as the species does in the east. There were innumerable possible nesting places about the farmstead that few eastern wrens could resist yet none of them were occupied. A few individuals were still present during the autumn visit. In 1918, Young noted it continuously and regularly from May 10 to Sept. 30. Specimens are distinctly *T. a. parkmani.*

199. *WINTER WREN, *Nannus hiemalis hiemalis.*

Not seen in 1917, but in 1918 Young observed single individuals from May 20 to 23,. and on Sept. 16.

200. *SHORT-BILLED MARSH WREN, *Cistothorus stellaris.*

Not uncommon in certain localities. While usually inhabitating damp marshes some were found in dry grass or even in brushy edges in typical House Wren ground. None were certainly recognized in the fall of 1917 though Young lists it occasionally from June 1 to Sept. 25.

201. *LONG-BILLED MARSH WREN, *Telmatodytes palustris.*

Hardly commoner than the Short-bill and not so widely distributed. This species requires wetter and more extensive swamps than that species and the drying up of the marshes would more severely limit its habitat. A Marsh Wren glimpsed on the shore of a small pond on Sept. 19, 1917, was supposed to be of this species. Owing to their more restricted habitat the Long-billed Marsh Wren was, in 1918, even scarcer than the previous year. Young only records occasional individuals May 7 and June 10. Specimens show the light back, and brown rather than black head of *T. p. iliacus.*

202. *BROWN CREEPER, *Certhia familiaris.*

Young took two specimens of the Brown Creeper on Sept. 23 and 26, 1918.

203. *RED-BREASTED NUTHATCH, *Sitta canadensis.*

One individual seen by Young on Sept. 24, 1918.

204. *BLACK-CAPPED CHICKADEE, *Penthestes atricapillus.*

Only seen in 1917 on May 20 and Sept. 26. Of the former one female was taken with an egg in oviduct ready for deposition. Scattered individuals noted by Young throughout the summer of 1918. Specimens taken have constantly longer tails than any but extreme eastern specimens and hence are referred to *P. a. septentrionalis.*

205. *RUBY-CROWNED KINGLET, *Regulus calendula.*

In 1917, single individuals seen May 20 and June 1. In September a few were seen nearly every day. In 1918, noted by Young daily from May 7 to 24 and Sept. 9 to 30.

206. *WILSON'S THRUSH, *Hylocichla fuscescens.*

Common. Its golden chain song could be heard every evening from our camp. In 1918, Young recorded it nearly every day from May 9 to Sept. 28. All specimens show the slightly olive back of the Willow Thrush, *H. f. salicicola.*

207. *ALICE'S THRUSH, *Hylocichla aliciae.*

Thrushes of this genus were fairly common during migrations, but the bush was generally so dense and the birds so shy that collection gave the only certain separation between Alice's and Olive-backed Thrushes. I was fairly certain that we had specimens of both in the spring collection of 1917, but they all were lost in transit. One specimen taken by Young on Sept. 19 belongs to this species.

208. *OLIVE-BACKED THRUSH, *Hylocichla ustulata.*

In 1918, Young noted thrushes under this heading from May 15 to June 1 and Sept. 6 to 20. All his specimens except one mentioned under previous heading are of this species which is probably the more common. We have specimens of the following dates: juvenile and adult males Sept. 18, 1917, Sept. 6 and 9, 1918; and juvenile females Sept. 9, 1918. These four are slighlty but consistently more olivaceous (or grayer) above and rather more heavily spotted on breast than comparable eastern *H. u. swainsoni* differing from them almost as much as the Willow Thrush, *H. f. salicicola* differs from the Veery, *H. f. fuscescens.* I find these same distinctive characters in an autumn specimen from as far west as Jasper Park but not in spring and summer birds from intermediate points. These specimens agree closely with the description and range of *H. u. almae* Oberholser, and if every perceptible difference is regarded worthy of a separate name this form probably has claim to reinstatement in the Check List.

209. *HERMIT THRUSH, *Hylocichla guttata.*

Quite common during the spring of 1917. The last specifically recognized was on June 2. In the autumn one was taken on Sept. 19. In 1918, Young noted the Hermit Thrush from May 13 to 24 and Sept. 3 to 30. These are of course eastern Hermit Thrush, *H. g. pallasii.*

210. *AMERICAN ROBIN, *Planesticus migratorius.*

Common on all visits, in 1918, at date of departure, Oct. 2.

211. *BLUEBIRD, *Sialia sialis.*

Though not known by the Ward brothers as a

bird of the locality, we took a pair in 1917 on May 28, and later some six individuals were seen at various times in the neighborhood. In 1918, Young saw 2 and 7 birds on June 24 and 25. On Oct. 2 as he was leaving there was a migrational wave of the species and he lists 50 for that day. This suggests that far from Shoal Lake being the most northern extremity of the species range here there is a habitat beyond that is occupied by them in considerable numbers. The species is apparently spreading into this country.

ADDENDA.

Since the publication of the earlier parts of this paper the following published data on the birds of the locality have been called to my attention in Recent Bird Records for Manitoba by E. T. Seton, *Auk*, XXV, 1908, pp. 450-454.

20. *(antea)* BLACK DUCK, *Anas rubripes.*

Mr. Seton here reports another Shoal Lake specimen of this species in his collection taken by Geo. H. Meacham in 1901 who reports "two or more were shot at Shoal Lake in 1899".

28. *(antea)* WOOD DUCK, *Aix sponsa.*

Seton says: "G. H. Meacham reports it rare at Shoal Lake, but one or two are seen there each year".

212 LEAST BITTERN, *Ixobrychus exilis.*

Seton says: "Frank M. Chapman saw one at Shoal Lake, June, 1901".

BRIEF REPORT OF THE OTTAWA FIELD-NATURALISTS' CLUB FOR THE YEAR ENDING MARCH 18, 1919.

The fortieth year of the existence of The Ottawa Field-Naturalists' Club has been the most successful in the recent history of the society. The club activities are directed toward popularizing and diffusing knowledge of the natural sciences, and have been carried on in three chief ways: a course of lectures, two series of field excursions, and the publication of THE OTTAWA NATURALIST.

The club membership now numbers 540. Twenty-one members serving overseas have been carried gratis.

The lecture programme consisted of seven scheduled lectures and a special lecture on wild geese by Mr. "Jack" Miner, of Kingsville, Ontario. The lectures are planned to create a more intelligent interest in Canadian natural history, and to give a better understanding of the value of scientific work.

The field excursions were well patronized, especially the spring series at which the attendance averaged 38. Weather conditions reduced the attendance at the fall series. The spring series consisted of five outings and the autumn series of three outings. Scientific men attended the excursions to direct interest and answer questions.

THE OTTAWA NATURALIST, the official organ of the Club has been enlarged in dimensions and improved in material qualities and by the introduction of a cover design, more illustrations and more articles of Dominion-wide interest.

At the request of several natural history societies of the Dominion, a plan of affiliation has been arranged, the magazine of The Ottawa Field-Naturalists' Club to be the medium of publication.

The officers and committees for the year 1919 are as follows:

President, M. Y. Williams; Vice-Presidents, L. D. Burling, P. A. Taverner; Secretary, Clyde L. Patch; Treasurer, F. W. Waugh; Editor, Arthur Gibson.

Additional members of Council: Hoyes Lloyd; W. T. Macoun, G. A. Millar, R. M. Anderson, J. M. Macoun, Miss M. E. Cowan, Miss Crampe, C. B. Hutchings, C. M. Sternberg, H. I. Smith, H. McGillivray, H. B. Sifton.

STANDING COMMITTEES OF COUNCIL.

Publications—Clyde L. Patch, A. Gibson, P. A. Taverner, L. D. Burling, H. B. Sifton.

Excursions—F. W. Waugh, H. B. Sifton, C. M. Sternberg, G. A. Millar, Miss M. E. Cowan, C. L. Patch, H. McGillivray, C. B. Hutchings, Miss Crampe.

Lectures—J. M. Macoun, P. A.Taverner, L. D. Burling, W. T. Macoun, G. A. Millar, R. M. Anderson.

Trust Funds—W. T. Macoun, C. Gordon Hewitt, H. M. Ami.

Auditors—J. Ballantyne, E. C. Wight.

LEADERS AT EXCURSIONS.

Archaeology—Harlan I. Smith, F. W. Waugh, W. J. Wintemberg, Dr. C. M. Barbeau, Dr. E. Sapir.

Botany—G. A. Millar, W. T. Macoun, J. M. Macoun, Mrs. A. F. Brown, Dr. M. O. Malte, J. R. Dymond, E. C. Wight, H. B. Sifton, Miss M. E. Cowan.

Entomology—C. B. Hutchings, Arthur Gibson, Dr. C. G. Hewitt, J. M. Swaine, F. W. L. Sladen, Miss Crampe.

Geology—Dr. E. M. Kindle, Dr. W. Y. Williams, H. McGillivray, L. D. Burling, E. Poitevin, Dr. M. E. Wilson.

Ornithology—P. A. Taverner, C. L. Patch, Dr. M. Y. Williams, A. G. Kingston, Hoyes Lloyd.

Zoology—Dr. R. M. Anderson, A. Halkett, E. E. Lemieux, E. A. LeSueur, C. H. Young, C. E. Johnson.

Photography—W. S. Hutton.

NOTES AND OBSERVATIONS.

AMERICAN SOCIETY OF MAMMALOGISTS.—The organization meeting of the American Society of Mammalogists was held in the New National Museum, Washington, D.C., April 3 and 4, 1919, with a charter membership of over two hundred and fifty, of whom sixty were in attendance at the meeting. The following officers were elected:

President, C. Hart Merriam (Washington); First Vice-President, E. W. Nelson (Washington); Second Vice-President, Wilfrid H. Osgood (Chicago); Recording Secretary, H. H. Lane (Oklahoma); Corresponding Secretary, Hartley T. H. Jackson (Washington); Treasurer, Walter P. Taylor (Washington). The Councilors are: Glover M. Allen (Cambridge); R. M. Anderson (Ottawa, Canada); J. Grinnell (Berkeley); M. W. Lyon (Washington); W. D. Matthew (New York); John C. Merriam (Berkeley); Gerrit S. Miller, Jr., (Washington); T. S. Palmer (Washington); Edward A. Preble (Washington); Witmer Stone (Philadelphia); and N. Hollister (Washington), Editor.

Committees were appointed on: Life Histories of Mammals, Charles C. Adams, Chairman; Study of Game Mammals, Charles Sheldon, Chairman; Anatomy and Phylogeny, W. K. Gregory, Chairman; and Bibliography, T. S. Palmer, Chairman.

The policy of the Society will be to devote its attention to the study of mammals in a broad way, including life histories, habits, evolution, palaeontology, relations to plants and animals, anatomy and other phases. The Society arranged to start the publication this year of a "Journal of Mammalogy," in which popular as well as technical matter will be presented. This journal will fill a long felt want in the natural history world, for with all the publications dealing with bird life on this hemisphere, there has been none making a specialty of the no less interesting and important mammalian life.

In choosing the name of the Society, the word American is used in the broad sense of including all the Americas, North as well as South. Canada was represented at the organization meeting by two men, and several Canadians appear among the charter members. The Society starts out democratically, with but one class of members, the general concensus of opinion being that the establishment of fellows and different classes of members would not be conducive to the good feeling and harmony desirable in a society of scientific aims. The Society invites the co-operation and support of all persons in the study and conservation of the mammalian life of America.

REMARKS CONCERNING SAND LAUNCES.—There has recently been received for identification by the Fisheries Branch of the Department of the Naval Service a number of small specimens of Sand Launce *(Ammodytes personatus)* obtained from Barclay and Clayoquot Sounds, British Columbia.

The genus *Ammodytes* is represented on our coasts by three reported species in all, and all of which inhabit sandy shores.

The geographical ranges of the three are as follows:

A. personatus: Shores of the Pacific from California to Alaska, embracing British Columbia and the Aleutian Islands and westward to Japan. (This is the species of which the Department received specimens.)

A. americanus: Maritime Provinces, Gaspe Basin, Labrador and Newfoundland, southward to Cape Hatteras, North Carolina.

A. dubius: Labrador and Greenland, southward to Cape Cod. (As its name implies this is a doubtful species, and was first recorded by Reinhardt in 1838.)

Altogether there are about eight different species of sand launces, of which, besides our own, may be mentioned *A. lanceolatus* and *A. tobianus*, both of which occur on the British coasts.

ANDREW HALKETT.

THE MOUNTAIN BLUE BIRD, AND ITS IRREGULAR APPEARANCE.—Every observer of birds has noticed the abundance or scarcity of certain varieties in different years, and the reason of this periodical variation in appearance is often hard to account for. There are several birds that come under this class in Alberta, and perhaps the most prominent of these is the Blue Bird, (ours is the Mountain variety *Sialia currucoides.)*

The winter of 1917-18 was quite severe up till about the middle of March, when it turned very mild and spring like. On the 21st of the month I was very much surprised to see three Blue Birds flying along the telephone wires on one of the principal streets of Camrose. This was fully two weeks earlier that I had ever recorded them before in my twenty-eight years residence in Alberta.

A few days later the weather turned suddenly cold, and the month ended with below zero temperatures. The cold extended into Montana, between 200 and 300 miles south of this latitude. There is reason to believe that these three birds were not the only ones to come north around the 21st of the month, and it is likely that a large migration took place at that time. The cold weather

came on so unexpectedly that there can be little doubt but what all the Blue Birds that ventured so far north at that time must have perished.

The consequence was that there was practically an entire absence of these birds in this district the following summer.

F. L. FARLEY,
Camrose, Alberta.

ON THE EARLY LIFE-HISTORY OF THE AMERICAN LOBSTER *(Homarus americanus)*.—Were this tiny creature, just after it has emerged from the egg, to be enlarged to say ten inches in length and a regular ten-inch long lobster put along side of it, two forms, quite unlike in general appearance would be seen. The reason for this difference in general form is because whilst the mature lobster crawls about upon the bed of the sea, the little juvenal does nothing of the kind, but swims, or rather floats upon its back, through the water or near the surface of the water. It would be interesting to follow out in detail how this most valuable of all crustaceans becomes more and more modified as it passes from moult to moult, but it must suffice for the present to point out that by the time the lobster has acquired the crawling mode of locomotion it has not then reached an inch in length. Obviously the free swimming mode of movement is primitive, and there are crustaceans, for instance the phyllopods, which swim upon their backs throughout their life-histories, but in the case of the decapods, which stand higher in the scale of crustacean life, and to which shrimps, crabs, and the lobster belong, this phenomenon is usually only temporary, and in the case of the lobster is purely so. Now when the mother lobster, guided by her instincts, approaches the more shallow parts of the sea in order that her eggs may hatch off her swimmerets, and once the eggs are all hatched off, her maternal duties are over, for that is all the maternity she has. The young nauplii are now left to their own resources. It was a wise provision of nature that led the mother lobster to the shallows, for the little helpless creatures are there defended against many dangers which would have been encountered further out at sea. Furthermore, they undoubtedly meet there with a plenteous supply of surface food. Nor is this all. In the sheltered harbors and bays the little lobsters have an opportunity to undergo their metamorphosis until as little crawling creatures they seek refuge among the sea-weeds and under the rocks; from which time on they become better and better equipped, through increase in size, a shell hardened with carbonate of lime, and a pair of powerful claws, to protect themselves at considerable depths in more exposed parts of the bed of the sea.

ANDREW HALKETT.

BOOK NOTICES AND REVIEWS.

INJURIOUS INSECTS AND USEFUL BIRDS. By Prof. F. L. Washburn. J. B. Lippincott Company, Philadelphia and London; 414 illustrations in text and four coloured plates. Price $2.00.

This volume prepared particularly for high schools and agricultural colleges is largely the result of 21 years of work in economic entomology on the part of the author. It will of course also be a useful work of reference for gardeners and farmers generally. Chapters one to six deal with the losses to agriculture due to insects and rodents; farm practices to lessen these; external structure of insects; collecting and preserving insects; insecticides, spraying and fumigation. Chapters seven to eighteen discuss insect affecting various crops, such as apple, pear, small fruits, grain, roots, etc. Chapter XIX on "Our Insect Friends"; XX, "The Relation of Birds to Agriculture" and XXI, "Some Four-Footed Pests of the Farm," complete the volume.—A. G.

OUTLINES OF ECONOMIC ZOOLOGY. By Albert M. Reese, Ph.D., Professor of Zoology in West Virginia University. Philadelphia, P. Blakeston's Son & Co. 316 pages. 194 illustrations.

This volume which has been based upon a brief course in economic zoology given by the author for several years in the above university, will be found of special value to students, not only those who are taking courses in general zoology, but also those who are interested in agriculture. The book is divided into fourteen chapters, as follows: I, Protozoa; II, Porifera; III, Coelenterata; IV, Echinodermata; V, Platyhelmenthes; VI, Nemathelmenthes; VII, Annulata; VIII, Mollusca; IX, Arthropoda; X to XIV, Chordata. The importance of the study of economic zoology is becoming more apparent every day.—A.G.

THE CANADIAN FIELD-NATURALIST

VOL. XXXIII. MAY, 1919. No. 2.

CANADIAN ABORIGINAL CANOES.

By F. W. Waugh, Geological Survey, Ottawa.

Canoeing, it may be remarked by way of introduction, is one of a number of things which have been borrowed, either for use or amusement, from the American Indian. The name, strangely enough, has been introduced from a region at some distance from that with which we are accustomed to connect canoe culture in its typical form, being derived from the word "canoa," in use among the Arawak of the West Indies. This was adopted in a similar form by the Spaniards, and as "canot" by the early French in Canada. The fact that there was already a name in current use, then, is no doubt the reason none of the names applied by the Indians of the Eastern Woodland area of America was adopted.

An Ojibwa term, fairly well-known from its employment by Longfellow in "The Song of Hiawatha", is "cheemaun". A name applied to a very large craft is "nabikwan". A Mohawk appellation is "gahonwe'ia"; rendered by the Onondaga, a related tribe, as "gaho'nwa". It is interesting to note, in the last-mentioned dialects, the close resemblance to the term for a bark bowl or trough.

Quaint early English forms, now obsolete, are "canow" and "cannoe".

There is little doubt that, in the earlier days of French exploration and settlement along the St. Lawrence and of English settlement in New England, the birch-bark canoe of Indian make was very soon adopted as the most convenient method of travel. We can readily infer, also, from early writers and other such sources, the extremely important part played by the canoe in the development of a very large portion of the North American continent.

It would obviously be most interesting to trace the canoe and other such devices to their origins, but there are indications that the problem in hand is one of the diffusion or spread of a cultural trait already elaborated, or partly elaborated, it may be in some other region. This is in part suggested by both the extent and the continuity of the area in which canoes are used. We can see that migrations of population, or the influence of one tribe upon a neighboring one (accultural influence) would soon disseminate the canoe idea, possibly in a simple form, very widely, and that, under the influence of the varied materials at hand and diversified requirements, specialization in various directions would later arise.

Materials naturally played an important part.. In areas where trees were not at hand, or were less convenient, such materials as rushes were sometimes built into a boat-shaped raft (see the balsa of California); or a skin-covered craft was employed, as in the Eskimo area, among the neighboring Kutchin of the Yukon, the Tahltan and other Athabascans of the Mackenzie region, and in some parts of the Plains) see the "bull-boat," a tub-shaped craft of skin and withes, used by various Siouan tribes, including the Mandan and the Hidatsa; also by the Arikara, a Caddoan tribe). The Omaha (Siouan) used hide-covered boats or canoes of ordinary type, but with a rude framework, indicating the slight development among them of ideas regarding navigation. In the last-mentioned craft, an oar or large paddle was used for steering, the paddlers sitting near the bow.

One of the most interesting developments in North American navigation was the canoe of birch-bark, which apparently reached its perfection in the Algonkian area, a region extending from around the Great Lakes, and some distance westward, to the maritime provinces and the New England states, though the birch canoe area exhibits cultural extensions in various directions, but particularly northward and westward to the Mackenzie river basin. There is little doubt that this distribution was largely determined by the range of the canoe birch *(Betula papyrifera)*, which extends practically from the Atlantic coast to the Rockies, as well as to some distance south of the international boundary. The disappearance of the birch southward is indicated by the fact that very inferior canoes of elm, buttonwood and basswood bark were constructed by the Iroquois of Central New York state and southward, who evidently found the materials last mentioned

more plentiful. The Iroquois canoe is everywhere stated to have been heavy and loggy, inconvenient for portaging and short-lived generally. In fact, so poor a craft it was in comparison with that of the Algonkians, that the Iroquois are said to have traded eagerly for the lighter and more substantial contrivance.[1]

Bark and skin-covered canoes, however, are not the only craft which have been used by Canadian Indians, since at least two other devices—usually constructed in a very primitive style—are found side by side with considerable advancement in navigation. The dugout, for instance, which is usually little more than a hollowed-out log, is employed by a great many tribes along with canoes of a much superior kind. Another very primitive-appearing contrivance, the raft, is distributed quite widely, though employed to a greater extent in some areas than in others.

It may be unnecessary, or even impossible, for us to decide which of the foregoing came into use first, but we should certainly be quite near the mark in placing the raft first in degree of simplicity, with the simpler class of dugout next.

THE BIRCH-BARK CANOE.

Practically everywhere within the region of Algonkian influence proper the birch-bark canoe was essentially the same, such differences as occur concerning mostly the shape of bow and stern, which has evidently been derived almost exclusively from a single pattern, with local variations in the amount of curvature or recurvature and the method of decking over at the ends, where such a device was employed. The Malecite (western New Brunswick) and Ojibwa forms are very good examples of the extremes in outline in the Algonkian region. The Malecite canoe also exhibits the decking-over sheet at the ends, with side-flaps, in a well-developed form. As we proceed westward, this sheet decreases in size in the Algonquin canoe of northern Quebec and Ontario and becomes vestigial in a smaller form used by certain of the neighboring Ojibwa. The same purpose, that of preventing the inflow of water, is accomplished by the recurving ends of the Ojibwa type with which we are most familiar.

Regarding the Algonkian tribes of central Labrador, Turner remarks that "a tribe of great dissimilarity between the Naskopies and the Little Whale River Indians (Eastern Cree) is that the birch-bark canoe of the latter is much more turned up at each end, producing a craft well adapted to the swift currents of rivers." He also states that "the occupants are skilful boatmen," that "sails are sometimes erected in a single canoe," and that "at times two canoes are lashed together and a sail spread from a single mast."[2]

An offshoot of the Algonkian canoe was the "rabiscaw" of the Hudson Bay Company, an extra large birch-bark craft designed to meet the demands of the fur-trade. A prominent feature was the high, upturned bow and stern decorated with gaudy designs.

At the western extremity of the bark canoe area we find at least two somewhat divergent forms which suggest an attenuation of eastern accultural influence, combined, possibly, with modifications from other sources. The Dog-ribs, an Athabascan tribe of the Mackenzie basin, like the Ojibwa, construct a birch-bark canoe having separate keel-pieces for the bow and stern. The small and narrow ribs and the slender, widely-separated siding or flooring strips extending from end to end, however, show some resemblance to kayak construction. A special feature (also showing a resemblance to the kayak)[3] is the fairly extensive sheet of decking at either end. Conspicuous side-flaps, of the type found in the Algonquin decking, are lacking. The seams are sewn with spruce root and gummed.

Among the Kootenay and the various Salish tribes of southern British Columbia is found a canoe of pine or spruce bark, rather rude in general workmanship and showing but little external resemblance to eastern forms. The most striking feature is the peculiar pointed extension of the lower part of bow and stern, which is said to be specially adapted to rapid rivers. From a structural point of view no radical difference from eastern types is to be noted. The bark of the yellow cedar *(Thuja excelsa)* is also mentioned as a British Columbia canoe-making material.

A Slave canoe from the neighborhood of Hay river (flowing into Great Slave Lake) exhibits an upward extension at the bow and stern which adds much to its picturesqueness. In other respects it conforms closely to eastern models.

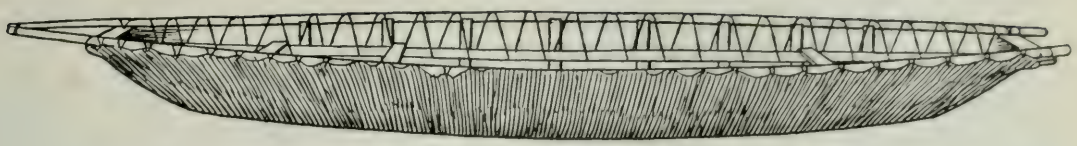
A description of Ojibwa canoe-making will no doubt give a fair idea of the methods employed throughout most of the bark canoe area.[4] The process is most interesting and requires considerable skill.

[1] Dr. E. Sapir, in "Time Perspective in Aboriginal American Culture," Memoir 90, of the Geological Survey (Canada), p. 20, remarks: "Similarly, the clumsy elm-bark canoe of the Iroquois seems less adapted to its cultural environment than the various types of birch-bark canoe of their Algonkian neighbors. We may risk the guess that the Iroquois bark canoe is an imperfect copy in elm-bark, a characteristically Iroquois material, of the superior Algonkian types, and connect this further with the general consideration that the Iroquois were rather more inclined to be cross-country walkers than the neighboring Algonkian tribes, who were more adept river and sea folk."

[2] Turner, Lucien M., "Ethnology of the Ungava District," 11th Annual Rept. of the Bureau of Eth., Washington, D.C., p. 182.

[3] Mention of this resemblance is made by Petitot, in "Autour du Grand Lac des Esclaves," p. 268.

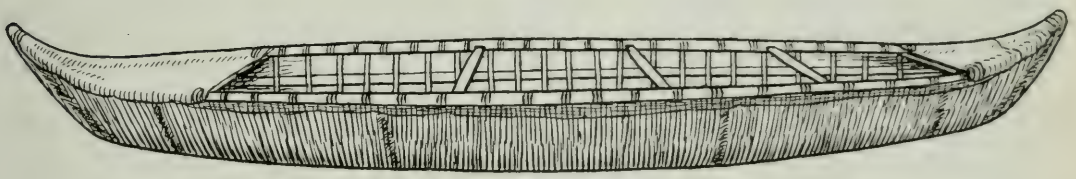
[4] From data obtained by the writer among the Saulteaux, or Ojibwa of the Lake Nipigon region. Permission to use this and other original notes was accorded by the Geological Survey, Ottawa, Canada.



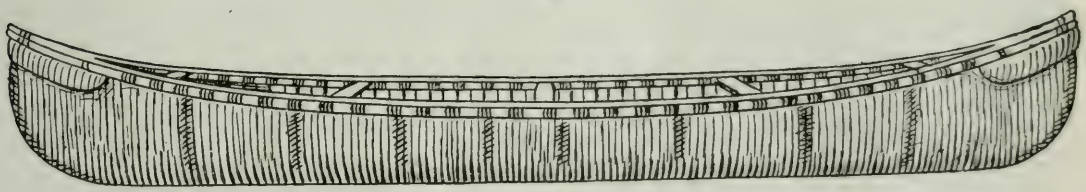
1.



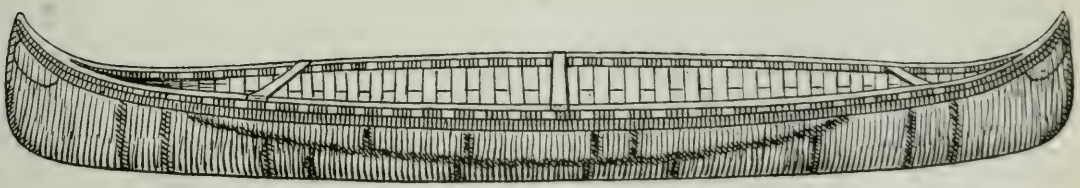
2.



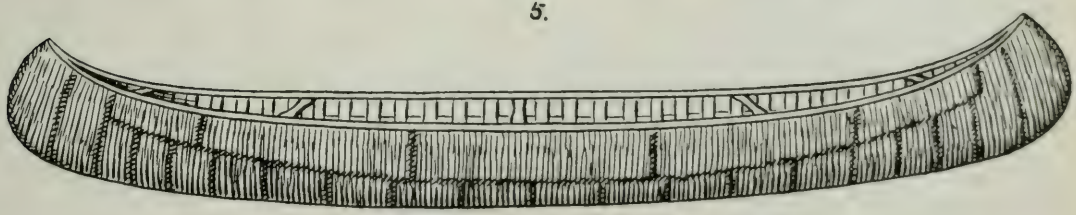
3.



4.



5.



6.

CANADIAN CANOES.

1, Alaskan Eskimo umiak, or open boat; 2, Labrador Eskimo kayak; 3, Dog-rib canoe; 4, Malecite canoe; 5, Algonquin canoe; 6, Montagnais canoe.

Thin strips of cedar *(Thuja occidentalis)* for the ribs, and the sheeting used between the ribs and bark to prevent injury to the latter, are obtained, split into approximate sizes and placed in water to render them more flexible. Another important requisite is the birch-bark, which peels off most easily late in June or early in July. This is rolled up and laid away in the shade. Towards evening, or at any time, if the day is cloudy, stakes (nine or more to a side) are driven into the ground at intervals to approximate the length and width of the canoe. These are made to flare outward slightly. The bottom pieces of bark are now placed in position, overlapping a few inches in the middle where they are to be joined. A single length of bark is preferred for the bottom. This, however, is not always obtainable, so that two pieces, or even three, may be used. Stones are laid on the bark to hold it down, and a bottom frame, approximating the width of the canoe at the bottom and pointed at both ends, is applied. The work so far is done by the men. The next operation, that of shaping the bottom by making slashes or gores on each side and sewing these with spruce root, is done by the women. The gores are made towards the ends, where the canoe begins to narrow. The upper edges of the bark are also trimmed evenly. The spruce root for sewing has been split by the women to a suitable size and rendered flexible by steeping in fish broth. The men next lay the upper lengths of bark alongside, measure them by trial, then place them in position. The bottom pieces are now scored along the bottom with an axe where they are to be creased for the taper to bow and stern, after which both upper and lower barks are pinched together by stakes driven closely and tied at the top. An inner frame (or "inside gunwale") giving shape to the upper edge of the canoe, and having exactly the right taper and curve, has been prepared beforehand and is now placed between the upper barks and sewn closely and firmly to them. Pieces of cedar, bent to the approved shape of bow and stern, are placed between the barks at the ends of the canoe, the bark trimmed to conform to these in outline, then sewn to them with spruce root. The sewing, as before, is performed by the women, to whom this part of the work is always assigned. Stitches of uneven length are often employed, particularly around the ends, to prevent the bark from splitting.[5] The gores and laps have in each case been well cemented or stuck together with clear gum boiled a little to thicken it.

[5]Other devices for preventing the edges from splitting along seams, are: The sewing of an extra strip of bark around the outer edge of the canoe beneath the gunwale; also the inclusion under the stitches of a strand of spruce root (often used along longitudinal seams where barks are joined). Both of these schemes are employed by the Dog-ribs, Slaves and Chipewyans.

The bottom frame, which is merely temporary, is now removed, the ribs taken from the water, bent to shape around the knee, cut to length and driven into place with a mallet. Other thin strips of cedar, three or four inches wide, are driven between the ribs and bark as the work proceeds. The purpose of these is to form a protective flooring and siding. The canoe, particularly at this stage, is kept well moistened both inside and out. The placing of the ribs and sheeting proceeds, generally speaking, from each end to the centre. Cross-pieces, to keep the top spread, are hammered in at every second rib. The ribs are a couple of inches wide and about the some width apart. When the insertion of ribs and sheeting is completed, the canoe may require a general correction in shape, which is given by tying it between stakes and exposing it for a while to the sun.

The next process, also a woman's job, is to get ready, or rather, to have ready, the spruce gum and to gum the seams. All laps have their outer edges running backwards or towards the stern, so as not to obstruct the motion of the canoe. The spruce gum is obtained from trees which have been gashed the year before, is boiled a while to thicken it and mixed with powdered charcoal—some say, to make it look nice. The bottom seam is coated with clear gum and pegged, not sewn.

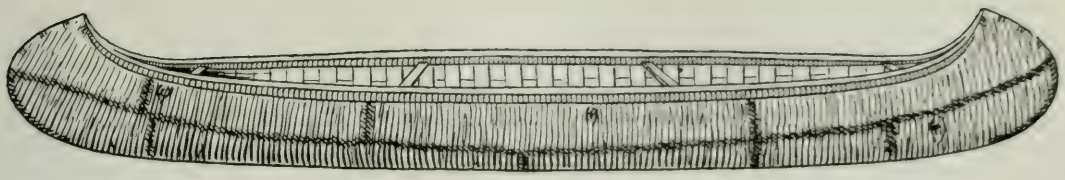
A little grease is said to be added to the gum by most tribes to render it more elastic. The addition of the powdered charcoal is not universal.

Among the Micmac of Nova Scotia and Cape Breton the women and girls are said to have prepared the gum by chewing it.

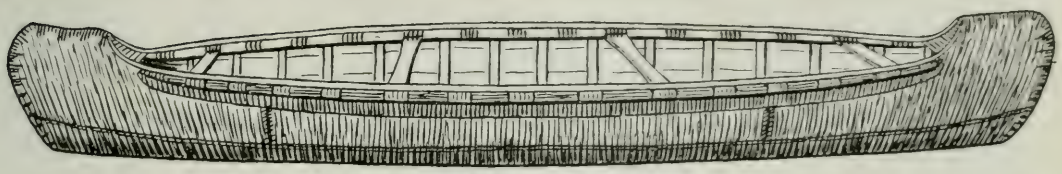
The last step in Saulteaux canoe-making is to attach a top gunwale strip. This is nailed on at present, but may have formerly been fastened on by tying or binding with spruce root.

The Malecite, according to information supplied by Mr. William McInnes, Director of the Geological Survey, Ottawa, construct temporary or emergency canoes of spruce bark which are used for bringing out furs from the hunting camps in the spring. The ribs and frame are roughly constructed of withes or saplings, flattened slightly and rather widely spaced, the bow and stern being chinked with clay.

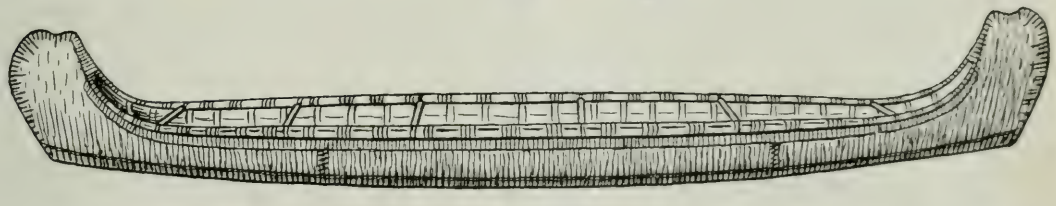
Mr. McInnes also furnishes an interesting description of the manner in which the Malecite protect the bottoms of birch-bark canoes in shallow streams: Lengths of spruce bark, with the smooth inner surface placed outward, are wrapped around the bottoms of the canoes from end to end and held in position by tying their edges to the thwarts with cedar inner bark. Another material, which is preferred to the spruce bark on account of its lightness, consists of strips of cedar about two inches wide and three-quarters of an inch thick. The strips run



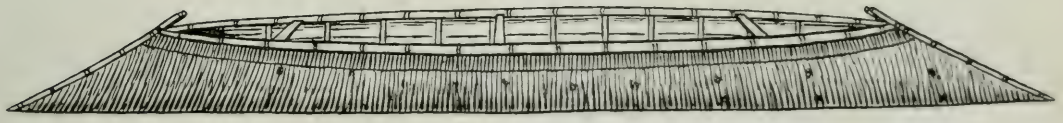
1.



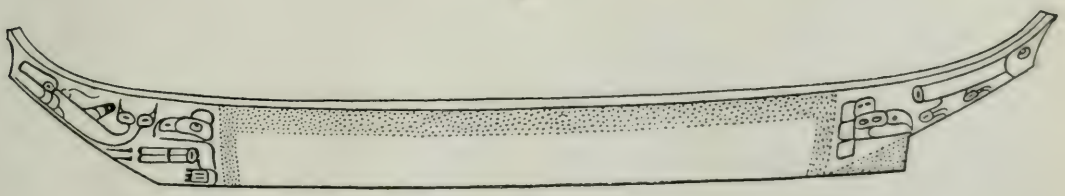
2.



3.



4.



5.

CANADIAN CANOES.

1, Ojibwa canoe (Northern Ontario); 2, Chipewyan; 3, Slave; 4, Kootenay, Shuswap and other southern B.C., tribes; 5, Haida.

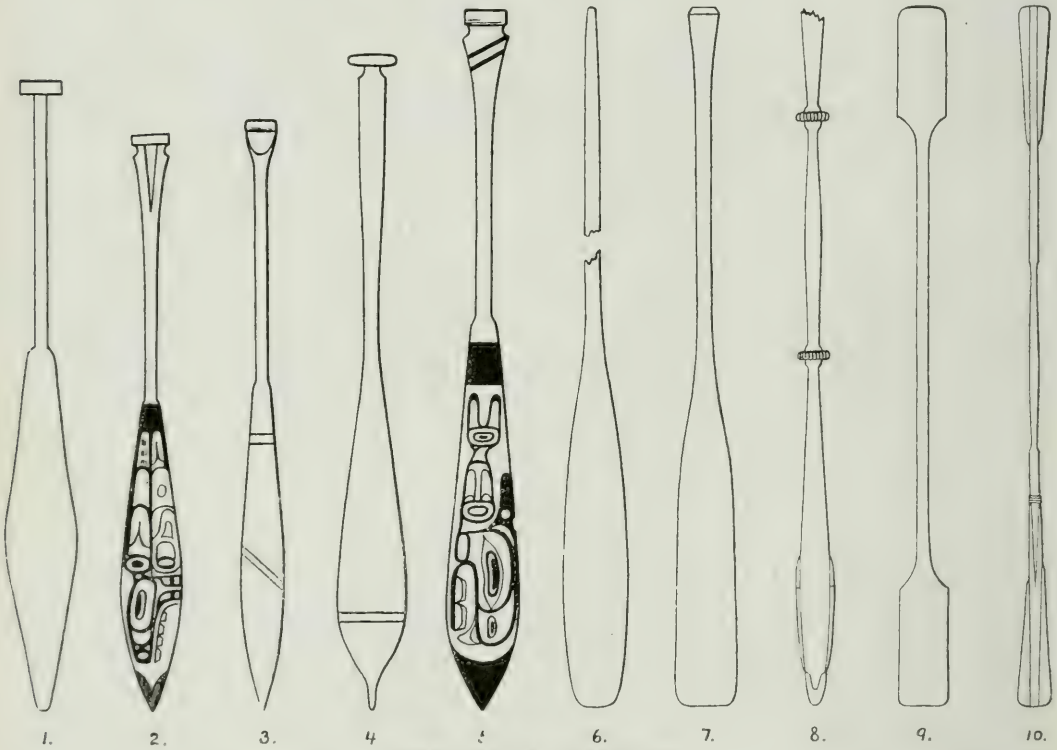
Nos. 3 to 6 on plate 1, and 1 to 3 on plate 2, are arranged consecutively to show how one form may have developed from the preceding.

lengthwise from end to end of the canoe, just high enough along the sides to afford protection from rocks, and are lashed together and to the thwarts by continuous strands of cedar bark which are threaded through perforations in their upper edges.

Micmac canoes in the Victoria Museum have the ends stuffed for a short distance with moss or shavings, the purpose being to keep the bark from collapsing or wrinkling where ribs are lacking. The stuffing is held in place by thin partitions of cedar, cut to shape and held in position at the bottom by the end of one of the inside sheeting strips. Slave and Chipewyan canoes also exhibit stuffing.

and navigation developed, with the exception that the Eskimo to some extent use large sea-going kayaks for hunting the whale and seal; and also that the Micmacs, like other coastal tribes, sometimes construct large bark canoes for a similar purpose. The sides of the Micmac canoe are up-curved and turned in towards the centre to exclude heavy seas.

The Eskimo kayak, for present purposes, may be regarded as a highly specialized canoe, differing from the Algonkian in the important, though not essential, respect of having the framework so constructed that it is held together independently of the cover; and in the superficial one that the covering



SOME TYPICAL PADDLES.

1 and 4, West Coast paddles, exact locality unknown; 2 and 3, Tlingit (northern B.C.); 5, probably Haida (Queen Charlotte Islands); 6, Kootenay (southern B.C.); 7, Ojibwa; 9, Copper Eskimo; 8 and 10, Central Eskimo. (The last three are neighboring groups).

In spite of its many excellent qualities and historic associations, the birch-bark canoe is evidently on the wane at present as a medium of travel. The factory-made canoe, though modelled after the Indian article, has, in fact, so far eclipsed it that it is seldom seen except among remote and backward bands of Indians who employ it mainly from economy or conservatism.

ESKIMO CANOES.

In only one region, the great insular area of the North Pacific Coast, was a true seafaring culture

is of skin instead of bark, to which we may add that of being decked over so as to accommodate, in most cases, but one person.

The upper rim or frame of two pieces is made first, with mortises for the insertion of ribs and thwarts and holes for lashings. The thwarts are placed in position and the upper part or deck practically completed, one of the last steps being the attachment of a middle strip lengthwise along the top, except where it is intersected by the opening or man-hole. The whole affair is then turned top or face down-

wards. The ribs are now shaped and fitted and their ends inserted in the upper side-pieces and secured with wooden pins. The ribs are usually from two to six inches apart. The other longitudinal strips are then attached to the sides, with a similar piece along the middle of the bottom, which, like the other canoes described, is destitute of a keel.

The sealskin covering is sewn together and applied to the framework wet, so that it stretches tightly as it dries. The sewing, as in the case of the Algonkian canoe, is done by several women working together in order to complete the job at one sitting. A double waterproof stitching renders the seams water-tight.

of Yukon Territory and Alaska possesses features which give it an intermediate position between the umiak and the canoe of the region to the south and east. A canoe-like feature is the wedge-shaped bow and stern. A pointed or leaf-shaped paddle is used.

The umiak is said to have been entirely abandoned on the east coast of Labrador.[7] In parts of the latter region and in Alaska it is used largely by the men for whale and walrus hunting as well as for general purposes. Lengthy journeys or migrations are often undertaken in it and its capacity is said to be remarkable.

The bow and stern of the Labrador umiak are



DISTRIBUTION MAP, the dotted portion showing the Eskimo kayak and umiak region, and the part covered by oblique lines, the birch-bark canoe region.

According to E. W. Hawkes, from whose memoir on the Labrador Eskimo the foregoing description is taken, "Great speed is maintained by the Eskimo in their frail kayaks. It is said that a single Eskimo in a kayak will propel it as fast as two white men will a canoe. The Eskimo ventures out in a sea that an Indian would not dare attempt. . . ."[6]

The umiak, an open craft, also used by the Eskimo, presents a somewhat different appearance from the kayak due partly to its not being decked over and partly to its being rather deeper and clumsier in form. In other respects it does not differ materially, a fact which would suggest it as the form from which the kayak was derived.

An open skin-covered boat used by the Kutchin wider than those of the Alaskan, which gives it a clumsier appearance. It is usually about twenty-five feet long and is steered with a rudder, quite likely an Asiatic borrowing, as are also the oars, rowlocks and sails. In Alaska the umiak is propelled by the more aboriginal paddle, the steering being done with an extra long and heavy one.

SAILS.

Sails were nowhere used as an integral feature of navigation except along the North Pacific Coast, where there is also a suspicion of Russian or other Asiatic influence.

The light and rather easily upset birch-bark canoe was evidently unsuited for propulsion by such a contrivance, except in very light breezes, or when

[6]Hawkes, E. W., "The Labrador Eskimo," Memoir 91, Geol. Survey, Ottawa, p. 72.

[7]Ibid., p. 68.

well loaded. That there was some appreciation of the assistance afforded by sails is likely, even though it failed to crystallize into a definite form. Catlin, for instance, states that among the Sioux a man would sometimes stand in a canoe facing the paddlers and hold a blanket spread out as a sail. The upper corners were held by the hands, while the lower part was tied to the body or to a thwart.[8]

Denys, a French explorer, speaking of the Micmac in 1651, remarks: "They also went with a sail, which was formerly of bark, but oftener of a well-dressed skin of a young moose. Had they a favorable wind they went as swiftly as the throw of a stone. One canoe carried as many as eight or ten persons."[9]

Skinner informs us, with regard to the Eastern Cree, that the "Canoes average twelve or fifteen feet in length, but those used by the Labrador of Athabascans living on Portland Inlet, B.C., used sails of Marmot-skin.

These items, from various regions, suggest that the idea of sailing may have existed in an incipient form here and there, though none of them is perhaps perfectly free from a suspicion of European influence.

Brinton, the well-known anthropologist, states quite positively that no sails were used by the Déné, or various Athabascan tribes which occupy an immense region extending throughout northwestern Canada. In this he is supported by Morice, a missionary who spent many years with the Déné.[11]

PADDLES.

Paddles differ little in pattern throughout the greater part of the area in which we have followed canoe navigation, until we reach the extreme west, or the Eskimo country at the north.



SAULTEAUX CANOE-MAKING: Placing upper barks in position and trimming.

voyageurs are often twice that size and sometimes more. They are capable of bearing enormous weights, and many will hold twenty or more men. The paddles used are short and rather clumsy. They have no swelling at the end of the handle to facilitate the grip. In paddling, the Eastern Cree take shorter and more jerky strokes than their Ojibway neighbors of the south. When a fair wind is blowing, a blanket or even a bush is set up in the bow for a sail."[10]

According to Boas, the Tsetsaut, a small group

Those used by the Ojibwa are extremely simple and are usually made of clear cedar. The paddler sits rather low, the toes turned inward and bent backward beneath the body. On a long journey a small pad of leaves or clothing is placed beneath the legs conveniently for sitting on.

A double-bladed paddle is used throughout most of the Canadian Eskimo region, although in Alaska the single paddle is found. Among the Aleuts of southwestern Alaska the paddle is pointed, like that of the Pacific Coast.

The Labrador double paddle is about ten or twelve feet long and made of hardwood or spruce tipped with bone. Leather rings on the handles keep the water from dripping on the paddler.

The British Columbia paddle and that used by

[8]Catlin, Geo., "Letters and Notes on the Manners, Customs and Conditions of the North American Indians," London, 1842, p. 214, and plate 294.

[9]Denys, Nicholas, "Description and Natural History of the Coasts of North America," The Champlain Society, Toronto, 1908, p. 422.

[10]Skinner, Alanson, "Notes on the Eastern Cree and Northern Saulteaux," Anthropological Papers of the American Mus. of Nat. Hist., vol. IX, part 1, p. 43.

[11]Morice, A. G., "The Great Déné Race," Anthropos, vol. 5, p. 441.

certain adjoining tribes, such as the Aleuts and the western or northwestern Déné, is invariably sharply-pointed or lance-shaped and has almost invariably a T-shaped grip.

British Columbian influence in this respect seems observable eastward as far as the Slaves and the Chipewyans, who have the paddle obtusely-pointed.

WINTER TRANSPORTATION.

A conveyance of the type represented by the canoe, which is suitable mostly for summer, naturally supposes a corresponding winter contrivance, especially for the northern part of our range. That this was, or is, actually the case is suggested by the close correspondence of the dog and sledge or toboggan area with that of the canoe (Eskimo Athabascan and Algonkian). The exceptions to this are found principally on the West Coast, where conditions are favorable to water transportation throughout most of the year; on the Plains, where the travois replaced the sledge or toboggan, and canoeing was of relatively slight importance; and in the southern part of the Eastern Woodlands, where the snowfall is comparatively light.



Saulteaux Indian inserting ribs.

THE DUGOUT.

The dugout, in most cases a rather crude canoe made by charring and hollowing-out a log ,also has quite a wide distribution and is found, as already noted, in many regions where a more advanced type of canoe is also used.

Among the Iroquois, who were noted as indifferent canoe-makers, it was quite extensively employed, and is still used for the navigation of small streams for trapping and other such purposes. The scarcity of better materials may have been a factor in its popularity. The favorite Iroquois material is pine.

Dugouts seem to have been used to a limited extent by the Ojibwa and by the Menominee, a tribe living in northern Michigan and Wisconsin, and fairly closely related to the Sauk, Fox and Kickapoo. This usage may also have been induced by a scarcity of the ordinary material, which is birch-bark.

The eastern dugout region seems fairly continuous southward from among the tribes mentioned, and would probably be contained very largely by the southern half of the Eastern Woodlands area, to which we might no doubt add the eastern half of the south-eastern area.

The canoe in common use on the lower Mississippi is a dugout, called "pirogue" by the French. The bow of this canoe is broad and sloping. The average measurement is forty feet by three in width, with a thickness of about three inches. A canoe of this size will carry twelve persons. The material is usually some light or buoyant wood. A craft called by the same name is still to be found in the old "Acadian" region of eastern Canada. The material used is white pine. A black walnut dugout is used on the Arkansas. Besides a dugout, the Chitimacha of the lower Mississippi manufacture an elm-bark canoe.

Bushnell, in speaking of the Choctaw of Bayou Lacomb, Louisiana, states that "dugouts were employed on the creeks and bayous, but evidently only to a small extent." The Creoles at present make dugouts eight or twelve feet in length from logs of black gum.[12]

Those in use among the Creeks (a Muskhogean tribe related to the Choctaw) were made of cypress

[12]Bushnell, D. I., jr., "The Choctaw of Bayou Lacomb, Louisiana," Bulletin 48, Bureau of Amer Ethnology, p. 18.

and are said to have had their ends slightly elevated and pointed.

Among the northern Ojibwa, Cree and Algonkian tribes generally, the dugout is conspicuous by its absence. The same remark holds good for the Plains tribes and for the Eskimo.

The Iroquois method of making a dugout is probably typical for the whole eastern region in which it is used.

A tree of suitable material and size was first cut down—in former times by burning, the fire being localized by applying some damp material above the point where the tree was to be burned through. The log was cut to length in the same way. The next step was to build a number of small fires at intervals on top of the log, then hack away the charred part with adzes. The fires were rebuilt and the work continued in this way until a suitable hollow was obtained. The ends were shaped in a similar way. The same method of hollowing-out dugouts and large wooden bowls is practised by the present-day Iroquois.

Among the Déné, the adoption of the dugout is considered by Morice to be of fairly recent origin, dugouts of balsam poplar having, in his opinion, replaced the original spruce-bark canoe. These dugouts are sometimes thirty feet in length by not more than three in the middle and are said to possess no elegance or design of beauty.

Along the Pacific Coast the dugout is the characteristic craft and is here elaborated into an article possessing graceful lines and considerable beauty of workmanship. Its development, both in the matter of size and finish, was no doubt due at least partly to the size and workability of the coniferous trees of the coast region, as well as to the decreased demand for portability. A factor which must have greatly improved the product of the last century or two is the introduction of modern tools. Huge seafaring dugouts were, and are still occasionally, made by the Haida and neighboring tribes of the northern Pacific Coast.

An interesting feature of construction is the retention of the simple or primitive method of alternate charring and hacking in hollowing-out the interior. The final adzing imparts a fine scale-like appearance. When the adzing has been completed the canoes are given additional beam by filling with water, which is heated with stones, after which the sides are forced apart by means of thwarts.

British Columbian dugouts in general bear a degree of interresemblance in outline and structure that suggests a common cultural or intercultural origin. A groove inside the stern provides a rest for the whaling and sealing harpoon.

The eastern dugouts, already described, though possessing some broad features of resemblance to those of the West Coast, are sufficiently different in general character to suggest a development under differing conditions.

RAFTS.

The raft is at least the crudest of the navigatory devices mentioned and possesses a distribution which is practically universal, though used in many regions merely as an occasional or emergency craft. Its form is usually extremely simple and seldom exhibits anything which can be dignified by the name of design or style, though occasionally there are exceptions to this. The balsa, found among certain California Indians and in isolated localities southward to Chili, is really a raft composed of bunches of tule or rushes tied together, although its pointed ends give it some resemblance to a canoe.

Regarding the northern Déné, we have the statement of Morice to the effect that they occasionally make use of rafts. "They are made of three dry logs bound together, with their larger ends aft, while a slightly tapering shape is given their opposite extremities. The logs are fastened together fore and aft by means of ropes, which, when of truly aboriginal make, are of twisted strips or willow bark, starting from one end of a crossbar placed over them and going round each of the logs and the bar alternately. Among the Loucheux, these primitive embarkations are used in combination with regular canoes."[13]

GENERAL REMARKS.

Decking, so prominent in Eskimo canoes, has been observed to be less extensive in the Dog-rib bark canoe, and still slighter in the Chipewyan, Algonquin and Malecite. It is interesting, however, to find it outside the Eskimo region. The side flaps of the Algonquin and Malecite and some Ojibwa decking sheets have been already referred to.

Sewing, like covering materials, exhibits changes based on geographical location, these consisting mainly of a transition from sinew (used by the Eskimo) to spruce root (used by nearly all Canadian tribes excepting the Eskimo and Kutchin); or, in a few cases, to the bast or inner bark of the basswood and elm (used by the Iroquois).

The seams in all bark canoes are gummed.

The wide, flat rib is characteristic of the Eastern Woodlands and extends westward to the Slave country. This is accompanied by an inside sheeting which covers the bark completely. Contrasted with the wide, flat rib, though not differing from it in principle, is the narrow and widely-spaced rib of the Eskimo, Kutchin and Dog-rib crafts.

A feature which seems to be closely associated with the birch-bark canoe in general is the separate strip or piece used to give shape to the bow and stern respectively. These are also possessed by the

[13]Morice, A. G., "The Great Déné Race," Anthropos, vol. 5, p. 443.

Kutchin skin canoe. In the Eskimo canoes they are continuous with the central strip along the bottom.

The differences in outline, which constitute the most striking superficial variations among the canoes described, are dependent principally upon the shape of the end strips or "fashion-pieces" just referred to. A reference to Plates 1 and 2 will show that a series may be found starting with a very simply curved bow and stern piece (Kutchin and Dog-rib) and proceeding to one having an almost perpendicular upper portion (Algonquin and Malecite), and from the latter form to one which is considerably recurved (Slave, Chipewyan, Ojibwa, Montagnais, Micmac).

The gunwale is another interesting item. Among the Slaves and the neighboring Dog-ribs there are two gunwale strips, an inside and an outside, bound at intervals with the sewing or binding material. A similar feature links together the Algonquin and the Malecite. An inside gunwale to which the upper edge of the covering is sewn continuously, is found among the Chipewyan, Ojibwa, Montagnais and Micmac. An upper or top gunwale characterizes all the Algonkian canoes. The Algonquin and Malecite have consequently all three gunwales; inside, outside, and top. The maximum of protection or reinforcement is evidently gained by this employment of three protective strips along the upper edge, although at some addition of weight.

THE FLORA OF KAPUSKASING AND VICINITY.

BY CAPT. T. W. KIRKCONNELL.

Pastures new are always seen through an alluring mist of anticipation, and when, some two years ago, it was my military misfortune but botanical privilege to be detailed for duty on the staff of Kapuskasing Internment Camp in further New Ontario, I waited with intense interest for my first opportunities for exploration. During my exile, unkind weather and strenuous duties have permitted far fewer local excursions than I had hoped for, yet I have been able to gain a fair approximate knowledge of the subarctic conditions that obtain here and of the vegetation which they have evolved.

Kapuskasing, in the so-called "Clay Belt," is situated on a river of the same name which joins the Mattagami, about one hundred miles from James Bay. The region exemplifies in its flora the inevitable selection power of rainfall, temperature, and soil. Lying within the path of the broad cyclonic disturbances that traverse North America from the southwest, it has an abundant rainfall and is consequently completely forested, except in the extreme north where under duress of temperature trees give place to scrubs. It also borders on the great northwestern reservoir of high pressure and so tastes the first bitter cold of anticyclonic gales. The menace of winter is felt throughout the greater part of the year, and during 1918 frost was registered in every month without exception. The great penetration of the winter frosts cannot fail to have a discouraging effect on plant life. During August, 1918, a drain was being dug through the camp at Kapuskasing and ice was encountered at a depth of four feet. Snow also persists in the bush until late in the summer. As a result, only species that are exceedingly tolerant of cold have survived the selection of ages, and even existing life is dwarfed and stunted. Finally, the soil almost everywhere is a heavy clay resting on gneiss and covered with from one to four feet of rich vegetable mould. Thousands of square miles have absolute homogeneity of conditions and the flora shows like lack of variety.

The change from Southern Ontario is marked and complete. As one travels northward from North Bay, the transition in the character of the forestation cannot fail to attract attention. In the long climb into the rock country deciduous trees are left behind more and more; white pine is supreme in parts of the Timagami area, but before Cobalt is reached the last white pine has disappeared; and in descending into the Great Clay Bog of the North one sees mile after weary mile of stunted spruce *(Picea mariana)*, broken at intervals by ridges of poplar *(Populus balsamifera)*, aspen *(Populus tremuloides)*, and birch *(Betula alba)*. First impressions of the endless leagues of spruce are peculiar. One might almost, by a stretch of the imagination, conceive of the scene being laid in Paleozoic times amid the forest of progressive Equisetales and Lepidodendreae which clothed the lower James Bay slope when the world was some æons younger. Closer inspection finds other trees eking out a minority existence. Cedar grows along river-bottoms, as do Alder and Willows. Balsam and Jackpine *(Pinus Banksiana)* are occasionally found, and the Mountain Ash *(Pyrus americana)* flourishes as a large shrub on higher ground. Any tamarack that I have found has been dead, apparently the victim of the Larch Sawfly.

My first botanical survey of the bush country impressed me more with the abundance of the species that were missing than with that of those present. After the swamps and bogs of Southern Ontario the new field seemed miserable and poverty-stricken. One of my earliest quests was for orchids. In Old Ontario I was on speaking terms with some thirty-two of these little aristocrats and the possibility of making some new acquaintance among them always added the keenest zest to a day's botanizing. Kapuskasing has treated me but poorly in this regard for here I have met only four species, all familiar. I found some *Habenaria hyperborea* growing sturdily in the lush grass beside the railway track, a common enough acquaintance before, but welcome now for the family's sake. Later search located *Microstylis monophyllos* and *Corallorrhiza trifida* on a damp, wooded hillside. They, too, were not prizes to bear home in triumph for the admiration of friends—poor, shy slips of green, they are the despised Cinderellas of their kind, with just a touch of inherited grace in their soberness. But one pleasant surprise was in store for me. I was tramping one mild June day through an open spruce woods that crowns the steep bank just below Weiswinin falls on the Kapuskasing. There was little undergrowth but a wonderful carpet of moss, a most beautiful display of *Hypnum Crista-castrensis* spread out like elfin ferns. Then suddenly I burst into an enchanted glade and saw the ground dotted with gems of purple and white and gold. It was the most wonderful bed of *Calypso borealis* that I have ever seen. I had never before come across more than two or three blossoms at a time, but here I could count thirty within a radius of three paces and over a hundred in sight. I felt myself a second Odysseus in Ogygia, with the rôles of infatuation reversed, and it finally needed the Hermes of a ravening appetite to tear me away from the spot.

Nor are orchids the only rare visitors; for even plebeians are very sparsely distributed here. The spring woods show few of the familiar faces of the south—no Hepaticas, White or Purple Trilliums, Bellworts, Leeks, or Dog Tooth Violets. I have found a few unhealthy specimens of *Sanguinaria canadensis*, *Viola cucullata*, and *Anemone parviflora*, but there is little else reminiscent of an Old Ontario spring. *Trillium cernuum*, a smaller plant than its brother *T. grandiflorum*, and characterized by a recurved peduncle whereby the blossom hides its face among the leaves whorled below, is met with occasionally. *Coptis trifolia* is plentiful in June.



Weiswinin Falls, May 22, 1917.

The slashed clearings and "*brûlé*" have a somewhat different flora from the woods. The first-comer to push through the mould was a stranger to me, and one whom I have never identified to my complete satisfaction in Gray. In the main it seems to answer to the description of *Anaphalis margaritacea*, var. *occidentalis*, being an erect dicœcious composite, with linear-lanceolate, subtomentose leaves and small whitish florets. It is, however, more fleshy and herbaceous than the Pearly Everlasting, flourishes in mucky loam, and never attains more than 3 dcm. in height. *Corydalis aurea* and *C. sempervirens* are ubiquitous in burnt-over areas, their supremacy being undisputed until the later arrival of

Epilobium angustifolium and *Cirsium muticum*. An abundant companion of these is *Mertensia paniculata*, a sturdy vagabond with purplish-blue flowers, handsome when young but becoming disreputable with age. *Caltha palustris* and *Veronica americana* succeed one another along swampy rills. The Crowfoots are represented by *Ranunculus abortivus*, plain but hardy, *R. pennsylvanicus*, and our childhood friend, *R. acris*. There is not much further change until autumn, when Asters and Goldenrods brighten the fields for a season.

Bog societies present little that is new. Sphagnum Moss, Labrador Tea, Laurel *(Kalmia polifolia)*, *Linnaea borealis* with its delicate twin blossoms, *Galium boreale*, *Pyrola chlorantha*, *Pyrola asarifolia*, *Moneses uniflora*, and quaint *Mitella nuda* are perhaps representative. I have yet to find the Pitcher-plant, Sundew, Valerian, and Gaultheria. Where spruce bog thins out into poplar knolls you find *Actaea rubra*, *Apocynum androsaemifolium*, *Aralia nudicaulis*, *Prunella vulgaris*, and sometimes a patch of *Pedicularis canadensis*.

Ecologically, one might almost speak of "portage societies" for I have found the open ground about portages a rich hunting-ground for species lacking elsewhere. There, outcropping gneiss is thinly upholstered with sod and abundant moisture tempers frosts and fosters vegetation. At the foot of rocky cliffs just below Kabahose falls, a forty-foot cataract some twelve miles south of the camp, I discovered last June an Eldorado of *Primula mistassinica*, a charming little flower, easily rivalling *Campanula rotundifolia* in grace; and when scattered along the brim of a magnificent foam-flecked pool of black water, it was doubly beautiful. Another "find" in the same spot was *Clematis verticillarus*. Beside Weiswinin falls, too, I gathered in a goodly harvest during the summer months. Blue-eyed Grass *(Sisyrinchium angustifolium)*, two less common Cinquefoils, *Potentilla fruticosa* and *P. tridentata*, and two unfamiliar Fleabanes, *Erigeron hyssopifolius* and *E. racemosus* grew there in abundance, along with *Aquilegia canadensis* and *Lilium philadelphicum*.

Weeds, the *profanum vulgus* of civilized fields, have immigrated but little so far, and the few ruffians to be found in this new country can be blamed on balast and poor seed. My rogue's gallery comprises the Catchfly *(Silene noctiflora)*, Chickweed *(Stellaria media)*, Ox-eye Daisy *(Chrysanthemum Leucanthemum)*, Vetch *(Vicia Cracca)*, Hound's Tongue *(Cynoglossum officinale)*, and Shepherd's Purse *(Capsella bursa-pastoris)*, but none grow yet in sufficient quantities to harrass the farmer.

Cryptogamic life I must dismiss briefly. Ferns are less plentiful than further south, but there is an abundance of Bracken, Bladder Fern, Maidenhair Fern, and Oak Fern. The Equisetaseae are well represented, and there is a great plenitude of Lycopods, especially *Lycopodium clavatum*, *L. dendroideum*, and *L. complanatum*. Many glades on higher ground can boast of a charming Lilliputian forest of these dwindling descendants of the Coal Measures. Mosses abound in the woods and are exuberant under portage conditions, *Bryum* and *Hypnum* forms predominating as usual. New "*brûlé*" is often a moist mass of Liverworts. Among fungi my most welcome finds were *Coprinus micaceus* and *Morchella deliciosa*, and these I did my best to exterminate.

A man of grass will be pardoned for venturing a few closing remarks on the zoology of the district. The only fish in the Kapuskasing river are pike, pickerel, black bass, and suckers, all of small size. Precipitous falls between here and James Bay apparently discourage ichthyic development. Insect life is plentiful (my fellow officers wax profane over armed hosts of *Anopheles)* but lacks the variety of the lower latitudes. In seeking Coleoptera I have found the Buprestidae and Cerambycidae well represented, while my Pay Sergeant, Alex. Miller, of Toronto, whose hobby runs to butterflies, captured some thirty-six different Rhopalocera during the summer of 1918, chiefly of the genera *Argynnis*, *Brenthis*, *Grapta*, *Vanessa*, *Lycaena*, and *Pieris*.

My register of birds totals about forty to date. The Whiskey Jack *(Perisoreus canadensis)*, the Arctic Redpoll *(Acanthis linaria)*, and the Snowflake *(Plectrophenax nivalis)* winter with us, the latter two whirling about in flocks of hundreds. Spring brings Horned Larks and Juncoes, and later on Robins, Song Sparrows, Phoebes, and the Veery Thrush. I have seen very, very few warblers. Ducks, Rails, Bitterns, and Sandpipers haunt the swampier stretches of the river, and a pair of Herring Gulls *(Larus argentatus)* have returned here summer after summer to fatten on the garbage from the internment camp. Our most distinguished visitor has been a Snowy Owl *(Nyctea)* who lit a few feet from my office door one cloudy noon last November. He was a magnificent specimen, white without a sullying fleck, and must have measured four feet from tip to tip of his great wings. We were permitted to step almost up to him before he took to flight and floated noiselessly away. Had murder been desired, a child could have shot him.

BIRD PROTECTION IN CANADA.

Canadian conservationists are to be congratulated upon the success so far achieved in bird protection in the Dominion. Probably the most important step ever taken in any country in this direction is the ratification of the International Migratory Bird Convention with the United States whereby the two great North American powers are bound to co-operate in the protection of migratory game and other birds. This is now the law of the land and founded upon international treaty.

In addition to a number of bird reservations created in the west we have lately achieved the following in the east: Point Pelee, Ontario, on Lake Erie, established as a wild life sanctuary; its unique bird life will be permanently retained in coming Canadian generations and a place reserved for them where they may see and hear the Mocking Bird, Cardinal, Carolina Wren and other southern birds of song and story within our own borders.

Lately, a bill has passed the Quebec Parliament preserving Percé Rock, the bird ledges of Bonaventure Island, and Bird Rock, all in the Gulf Coast, as permanent bird havens, and the threatened destruction of some of our national wonders is prevented.

The next serious protection problem is the condition of bird life on the north shore of the Gulf of St. Lawrence, the "Canadian Labrador." Today we have every reason for serious effort in this direction,—economic, that a necessary food supply shall not be lost to the inhabitants of this bleak and desolate coast; sentimental, that no form of innocent life perish from the face of the earth; and moral, that we live up to the conditions and responsibilities imposed upon us and agreed to by us in the solemn treaty we have entered into. The following correspondence from those who speak from first hand observation on the Labrador coast, will indicate how critical this question is and how necessary it is that all join together in assisting and supporting Dominion officials in this direction.

BOSTON, MASS., DEDEMBER 11, 1918.

To the Editor of THE OTTAWA NATURALIST:

The following note received by me from Dr. Robert T. Morris, of New York, which he has allowed me to use in any way that will do good, is deserving of the widest publicity.

The chapter he refers to in my book was published in advance in 1916 in the seventh annual report of the Commission of Conservation of Canada, and describes in detail the terrible destruction of bird life on the coast of the Labrador Peninsula. The subject is so important, if the bird life of this region is to be saved, that I have taken the liberty of quoting from this chapter some suggestions which I believe to be of vital importance.

"What then is to be done? Is there no hope for the birds and for the people to whom the birds are such a valuable asset? I think there is. I believe that the whole problem can be solved most rationally and satisfactorily for all concerned by the immediate establishment of *bird reservations*. These should be islands or groups of islands or suitable portions of the main coast that can be watched by guardians. Here the birds should be undisturbed and allowed to rest, feed and breed in peace. The people should be made to understand that these reservations are not established to cut down their hunting, and thereby invite poaching and violation of the laws, but for the purpose of preserving and increasing the birds so that there shall be better shooting for everybody on the coast.

"A campaign of education is necessary, therefore, and I believe that the bird reservation will do more good in making the people understand, not only the need of bird conservation, but its advantages. The game wardens will be looked upon, not as enemies to be avoided and cheated, but as friends who are working for the people's good. If the matter is well managed, the people will regard their reservation with pride, and public opinion will keep the birds there inviolate. The wasted regions near fishing villages now devoid of all sea-bird life on the one hand and the crowded bird reservations on the other will be powerful object lessons in this process of education. I would suggest the placing of a brief notice on each reservation, printed in English, as well as in French, Montagnais or Eskimo, where these languages are used, worded somewhat as follows:

"BIRD RESERVATION

"The purpose of this reservation is to preserve the birds from destruction and to increase their numbers, so that there will be better shooting on the coast. The people are asked not to disturb the birds or their eggs on this reservation and to avoid the use of guns in its neighborhood."

CHARLES W. TOWNSEND.

616 Madison Ave.,
NEW YORK CITY, NOVEMBER 15, 1918.

To DR. CHARLES WENDELL TOWNSEND,
98 Pinckney St.,
Boston, Massachusetts.

Your treatment of the subject of conservation in Labrador in the book, "In Audubon's Labrador", which I have read with great interest, meets with my approval or more than that. On my trips to the Gulf Coast of Labrador and on the eastern coast

as far north as Hamilton Inlet, I observed that the Newfoundland cod fishermen were in the habit of raiding all the islands and adjacent mainlands on Sunday and making way with the eggs and the young of all the sea-birds. Some of the islands were wholly deserted so far as bird life was concerned and your Captain Joncas told me that in addition to the Newfoundland fishermen a number of men were engaged in the business of egging and that the eggs were preserved in brine and sold to the crews of various vessels. He said that the egg hunt was continued until such a late date in the season that the young birds which finally hatched were not strong enough to withstand the autumn storms and he had seen thousands of young birds thrown up on the beaches. When I have been on the coast the Newfoundland fishermen destroyed young birds for sport, leaving them where they fell on the ground if they were of species not good to eat.

The waste of food fish also is very great along the Labrador coast. Small cod and hake which are not desired by the fishermen are often smothered in the traps or killed when the traps are emptied and I have seen them floating for miles on the surface when the trappers were at work. The cod trappers catch a great many adult salmon by setting their nets in the channels when the salmon first make their way towards the rivers. This is illegal, but is winked at by the officials. A remarkable waste of salmon occurs in September when the herring nets are used near the coast. This is the time of year when the smelts are descending from the rivers and putting out to sea. They are captured in quantities in the herring nets.

ROBERT T. MORRIS.

BIRD MIGRATION.

BY H. MOUSLEY, HATLEY, QUE.

It is rightly said no doubt that "old traditions die hard," and therefore it is not so very surprising perhaps to find in Mr. C. B. Hutching's short note on the above subject in the November number of THE OTTAWA NATURALIST, page 97, that a writer in the *St. Louis Republic*, whilst considering the idea of birds flying in the rarified atmosphere three miles above the earth's surface, and being guided by the topography of the country at night, when flights are mostly made, as being somewhat erroneous, propounds a solution equally erroneous to my mind, when he suggests that they guide their course by means of the stars.

Speaking personally I have long ago given up cherishing "The fairy tales of science, and the long result of Time;" which to put it in a nutshell, amounts to considering birds as self-conscious animals like ourselves, instead of sub-conscious ones, governed by some impulse imperfectly known at present.

To imagine that birds are capable of shaping their course by means of such landmarks as mountains, rivers or even stars, seems to me to be somewhat far fetched, especially when we consider that a large proportion of them migrate at night, and sometimes on the very darkest nights too, when all of these landmarks, including the stars, would be invisible. No, there must be some other explanation to account for this unerring intuition (or call it what you like) in the animal world, and that explanation lies in the fact, I think, that in pure nature there is no such thing as self-consciousness, or the power of reasoning, although some of the higher animals, such as dogs, horses, etc., from long and intimate association with man, no doubt at times display traces of it, in the same way that some human beings are still abnormally susceptible to subconscious impressions, a relic of conditions existing before the evolution of self-conscious mind.

All wild birds and animals however I believe are subconscious, and therein lies the secret of their making no mistakes, for they do not reason as human beings do, but know just what ought to be done, and when and how to do it, in the same way as the larva knows exactly when it is full fed and must pupate, as well as where and when and how that process is to be accomplished, and the birds the time of migration, the nesting period, the rearing of their young, and the time to return to their winter quarters, without the aid of any landmarks whatsoever in either case. To understand this more fully one must be prepared to accept the fact that telepathy (now recognized by science, but which up to the present we have been unable to turn to practical account by mechanical means as in the case of the Marconi wireless system) pervades and is general throughout the entire animal kingdom. It is a potential faculty (working on an astral plane unknown to us at present) which inter-connects subconscious mind, and permits silent intercourse to become established. But just as in the case of electricity and wireless telegraphy, electric force must pass in the one case along a wire connector, in the other through a psycho physical medium (ether) before it

can be energized, so in the case of telepathy and telœsthesia which if not identical with electricity operate much in the same way, a circuitous connection must be established before results can be obtained. These results in the case of telœsthesia are no doubt enhanced by the cover of darkness (just as they are said to be in the case of the Marconi system) this accounting no doubt for so many birds migrating at night. In telepathy (mind blending) and telœsthesia (perception at a distance, or power of vision passing the limits of time and space) however the forces operate through a medium not apparent at present to our sense, and therefore we cannot determine the necessary conditions, or realize their full significance, but this may possibly be an open book some day, when sufficient time can be given to the study of life functioning on a plane other than our own.

My studies in the field of late have more and more convinced me that in telepathy and telœsthesia we have the means of answering some of those awkward questions which are for ever perplexing the followers and believers in the old idea that birds are self-conscious beings, and perform their wonderful feats by a process of reasoning. As a matter of fact these facts are not so very wonderful as natural, because they belong to the infallibility of a subconscious, and not to the reasonings and hence mistakes of a self-conscious mind.

In conclusion I see in the late war one of the most definite proofs against the belief that birds are self-conscious for had they been so they would surely have forsaken the battlefields of France and Flanders, which has not been the case. The residents have remained just as usual, and the migrants have come and gone likewise. Thus in face of danger of which they know nothing the birds have kept on the same course and frequented the same places, which for countless ages have been their custom, and despite the noise of battle have nested as heretofore, surely a proof that they do not act on their own responsibility, but are dependent on the ruling of their subconscious minds.

THE WHITE PELICAN, *PELECANUS ERYTHRORHYNCHOS, IN ALBERTA*

By F. L. Farley, Camrose, Alta.

Sometime in the summer of 1908, I heard of an island in a lake about 18 miles north of Camrose, where a large number of White Pelicans nested. After more enquiries I learned that the island was in the furthermost North Miquelon lake, one of several beautiful small bodies of water lying to the south of the Beaver Hills. At the time there were practically no trails leading into that new country, and with one exception no land had been taken up around the lakes; it was therefore in its natural state. I was not able to visit the island until the shooting season opened, when a friend and I drove to the lower lake, and with a row boat worked our way through this and the middle lake, and made a short passage into what we named Pelican lake. This body of water is about two miles long by one mile in width and the timber grows to within a few feet of the high water line. The island is quite descernible about one mile out in the lake. The two outstanding features were the several large nests up in the trees, which turned out to belong to the Great Blue Heron, and the large wave of white which seemed to cover the eastern shore of the island. As we came near this apparent white wave turned out to be Pelicans, some of which were on the beach and others close by in the water.

Before we approached to within 500 yards, those that were not in the water joined the others, and swam around the south side of the island, and upon our speeding up, they arose, a few at a time, and before we reached the shore the whole flock was high in the air, moving in wonderful formations almost immediately overhead. A small flock seemed to be particularly interested in us and came down to within close range, so close that the black markings showed quite clearly. Others were probably half a mile high, and about half the flock were at such an altitude that they did not look larger than small gulls. When a flock of these birds are wheeling and circling in a close set company of from ten to fifty, their appearance in the air is one of almost unbelievable change. When they are sailing in such a way as to present their horizontal aspect to the distant observer, they are nearly lost to view, but when they are banking for a turn, there comes to view a wonderful brilliance of white wings and bodies, flashing in the sunshine, beautiful beyond the powers of one's mind to imagine, and at a distance of a mile or two the transcendent ease and grace of their flight is intensified, because all hint of effort and of wing motion is lost to the observer.

We remained on the island for about an hour, and before we left the lake the birds had alighted on a long stony bar a short distance to the west of the island. Our estimate of the number of Pelicans, after failing to count them several times, was

about 500. The island is less than two acres in extent. The east end slopes to the water and is quite narrow, and from there to the western extremity the ground gradually rises until it is about fifteen feet above the water. There were at that time about one dozen Balm of Gilead trees, a few willows, and one spruce tree, mostly on the higher part of the island, some of which were dead. The Balm of Gilead trees were about one foot in diameter and thirty to forty feet high. The only grass that grew on the island was close to the waters edge. A very strong growth of nettles covered practically all the higher part of the island. Running through the centre of the island from the south there was a small depression on which nothing was growing, and it was here that the Pelicans nested. Scattered all over this sandy loam were hundreds of eggs which had never hatched, now entirely dried up inside. These were about the size of goose eggs, but the surface was quite rough and chalky.

On May 29 in the following year, 1909, I visited the island again and found about the same number of Pelicans. Most of them on my approach were out on the stony bar, but there were about fifty up the little draw where the eggs were on our first visit. Before I landed these quietly walked to the water and swam away to join the others. The stench that seemed to be everywhere after leaving the water, was beyond description, and I thought it would be impossible to remain long enough to make the investigations I hoped to. However, I soon got used to it; perhaps I forgot it when all the varied sights came before me. Climbing up the bank I soon came to the nests, some with eggs inside, but often with as many outside. The nests were nothing more than depressions in the loam, with a slight banking up on the outside. There was no lining whatever, and it was evident that different birds used the same nests, from the various sizes of the eggs. The number of eggs varied from one to five, and at this date they were very little incubated. About one-third of the eggs were scattered here and there over this part of the island, some quite a distance from any nest, and I concluded that these must have been thrown out by the birds when they left the nests hurriedly, as no doubt they are very clumsy in their movements on land. This, then, would explain the great number of eggs that were not hatched the previous year.

During my inspection of this breeding ground there were many other sights on all sides to interest one. Up in the larger trees there were Great Blue Herons, some on their nests, and others keeping guard. On the small trees were about a dozen Double Crested Cormorants, some of which were setting on their nests of three and four beautiful bluish eggs. These nests were small and flat, built of sticks and put together very loosely. In a hollow stump I found a Golden-Eye setting on a nest full of eggs. A little further on, a Mallard flew up from her nest of well incubated eggs. House Wrens, Yellow Warblers, Yellowthroats, and Tree Swallows were nesting on the island, and on the shore Spotted Sandpipers and Yellow Legs were feeding.

The following July another visit was made, and as the island was approached the Pelicans came to meet us. Up on the island we could see what looked like a small flock of sheep huddled together. These proved to be the young Pelicans, the entire increase for the year of this colony, nineteen only. It seemed a tragedy to think of this small number from perhaps six hundred eggs. There were the usual number of unhatched eggs lying around, at least several hundred. As I moved toward the young ones they waddled off slowly, but gave no note of alarm. Some of the old birds flew down over the island, and very rarely gave a small cry, this was the only note I ever heard from them. The stench at this time was even worse than in May, likely due to the number of dead fish lying around, which were partly decomposed. About a month later when motoring through the lake we came onto the little flock of young, still nineteen in number.

The following two or three years this colony used the island for their summer home, but the land around the lake was gradually being taken up, and no doubt farm boys wanted to see the big birds, and this with the ever increasing number of motor boats on the lakes, must have disturbed the Pelicans so much that they deserted it entirely. The Government made the lake a preserve and appointed one of the settlers a guardian, who posted notices forbidding anyone landing on the island, but it was too late, and people are wondering where the former owners of the island have gone. A half-breed told me that many years ago the Pelicans nested on all the islands in these lakes, and that they were as plentiful as geese in the fall. He said the Cree name for them was Cha-Chac-Kw.

Last fall, Dr. R. M. Anderson, of the Canadian Geological Survey, and I spent some time on Pelican island, and there were no signs whatever of Pelicans being there during recent years. All the trees had fallen and the entire surface of the island was covered with nettles. I never saw a Pelican migrating, and as Camrose is directly south of where this colony lived, I am of the opinion that they must come and go by night, or they would have been noticed passing over.

NOTES AND OBSERVATIONS.

Mr. Levi Penney of Woodlawn, Ontario, reported an unusual abundance of fall ducks in Constant bay on the Ottawa river, and attributes the phenomenon to the epidemic, during the shooting season, of influenza, which in various ways prevented the exodus of city gunners.

CLYDE L. PATCH, OTTAWA.

Last fall while rabbit hunting near Ottawa, Mr. Phil. Brady observed, resting about ten feet from the ground in a cedar tree, a Screech Owl which held in its claws an adult Ruffed Grouse. The death of the grouse, the throat of which was torn, cannot with certainty be credited to the owl which may have secured it after it had been killed by another agent; nevertheless the remarkable fact remains that the owl had sufficient strength to carry the grouse to an elevation of ten feet.

CLYDE L. PATCH, OTTAWA.

AN HERMAPHRODITE LOBSTER.—In the month of November, 1917, whilst engaged in making special observations on the lobster at Bay View, Pictou county, N.S., I found in a fisherman's trap, just after it had been drawn out of the sea, a lobster which was absolutely male on the left side and absolutely female on the right side. The specimen was sent intact to Dr. A. P. Knight, Queen's University, Kingston, Ont., with whom I was associated. This find was surely a remarkable one.

ANDREW HALKETT.

Reading Mr. Harlan I. Smith's note in a recent issue of THE OTTAWA NATURALIST, I am reminded of a mishap which befell another bird some years ago. While passing one of the fine spruces on the grounds of the Ontario Agricultural College, Guelph, my attention was arrested by a fluttering of wings among the branches, which I found to come from a robin dangling by the tail from a tuft of twigs. Excited by my closer approach the bird managed to free itself, leaving behind a half-dozen tail feathers, which proved to be firmly glued to their anchorage by means of ordinary tar! Presumably it had come here and perched, perhaps over night, within tail's-length of the unfriendly mesh of branchlets, after having first frequented some newly-tarred surface in which the tips of the feathers had become daubed.

HERBERT GROH, PRESTON, ONT.

THE CANADA JAY.—There are few campers in the northern woods of Ontario who have not met with the Canada Jay *(Perisoreus canadensis)*, one of the most delightful of birds in spite of its bad qualities—Wis-Ka-Tjan or thief the Indians call it; it has well earned its reputation. The lumbermen have corrupted the name into Whiskey Jack and if any of their number misses some whiskey he is advised to go to this bird for information. Not only will this bird steal everything in the way of food about a camp, but we are sorry to say it will also eat the eggs of other birds as well as their young. If it were not for these bad qualities the most appropriate name for it would be "The Grey Nun" for with its beautiful grey color—white forehead, white throat and black at back of head and neck, also its delightfully soft eyes and gentle manner, it is typical of the nun. Although not seen in large flocks, half-a-dozen or more may often be met, and when they discover a camp in the woods there is great jubilation, we might say laughter, for their note at this time is much like laughter.

It might be supposed that a few such birds, somewhat less than eleven inches in length, could not make much impression on a hanging deer, and the camper would be surprised to find that one of his best haunches had disappeared in a few hours, this taken piecemeal and most of it hidden for future use. Last September when watching these birds it was noticed that they did not carry all their supplies to one place, but to several places and they were often tucked away between a hanging piece of bark and the trunk of the tree.

The Whiskey Jack is probably the easiest of any of our birds to tame. When camping not long ago, and while preparing a duck for cooking, in which one of these birds was much interested, it was induced to come and peck at the duck. Having once tasted this delicious morsel it forgot all fear, and drawing the duck gradually nearer the writer played hide and seek with it round his body and over his thighes the Whiskey Jack following. From that date this bird became our pet and would freely eat out of our hands. It would also come into our tent and wake us up by walking over us if breakfast was delayed too long.

F. F. PAYNE.

AN EPIDEMIC OF ROUP IN THE CROW ROOSTS OF THE LOWER THAMES RIVER, KENT CO., ONT.—Residents of the lower Thames valley, west of Chatham, Ont., report that large numbers of crows regularly winter in western Kent county and roost in the orchards and groves along the river. Mr. John Johnston says in a letter to the writer that "the date when the crows first wintered here was about 1895. It was a mild winter and a very late fall, and not a great deal of snow. They started

to gather in flocks about October. The number I should judge, would be well up in the thousands and it has materially increased ever since. They fed principally on corn and dead animals and also on garbage in the towns. Every time we had a cold spell hundreds of them died. I am told that the place where they have been in the habit of roosting (McGavin's) the ground is now (Feb. 10th, 1918) covered with dead crows."

Mr. William Holmes residing about 4 miles below Chatham, relates that there was a great flight of crows in 1904, large numbers remaining all winter feeding on the corn left standing in the fields, or in the fields in stooks. Thousands died. As Mr. Holmes protected the crows on his property, his orchard of 400 trees was "literally packed, and the ground underneath (was also) packed, and the pigs (were) busy every day for weeks eating the frozen and blind, as there seemed to be a disease of the eyes, a white film growth over the eyeball. Though they seemed healthy and strong (they) would walk around as blind as a bat." They remained with him until late in the spring.

There is no doubt but that the affection from which the crows were suffering was the same as that described by Eldon Howard Eaton* as occurring in the Canandaigua Crow Roost of New York State in December, 1901. This disease he determined to be "roup," and his description of "the eyes" being "usually blinded by a membrane forming over the exterior of the cornea" agrees accurately with Mr. Holmes' description given above. Eaton states that the disease did not appear either "in the Rochester roost or in that near Niagara Falls" . . . "the disease disappeared with the coming warm weather." The last evidence of it noted by Eaton was on April 6. He states "it is probable that one thousand crows died of this disease during the last winter in Ontario county."

Both Mr. Johnston and Mr. Homes believe that the crows assisted in the spread of the San Jose scale, which Mr. Johnston states was first introduced into the orchards along the Lake Erie shore on nursery stock from the United States. Mr. Holmes informed me that the scale made its first appearance in his orchards the summer following the great flight of crows, and in spite of all his endeavors to check it, in three years' time it had "won out." The whole orchard along the river was killed.

M. Y. WILLIAMS.

*Auk, Vol. XX, 1903, pp. 57-59.

BOOK NOTICES AND REVIEWS.

CLASS BOOK OF ECONOMIC ENTOMOLOGY, with special reference to the economic insects of the Northern United States and Canada. Philadelphia: P. Blakeston's Son & Co., 436 pp., 257 illustrations; price $2.50.

We were much pleased to see this new volume on insects, prepared by one of our own members—one who is held in high regard by entomologists generally not only throughout Canada, but the United States as well. The volume is a class book of Economic Entomology, with special reference to the economic insects of the Northern United States and Canada. It is a companion volume to Reese's book on Economic Zoology. It is divided into four parts: Part I, discusses the structure, growth and economics of insects; Part II, the identification of insects injurious to farm, garden and orchard crops, etc.; Part III, the classification and description of common insects; Part IV, the control of injurious insects.

Briefly, this new book on Economic Entomology is one which undoubtedly will be well received. It will certainly find a useful place among economic students. The descriptions are concise and to the point, the illustrations well chosen and the printing excellent.—A.G.

THE WORKS OF J. HENRI FABRE. Translated by Teixeira De Mattos. N.Y., Dod, Mead & Co. The writings of the great French naturalist, J. Henri Fabre are only now becoming widely known though the writer was a contemporary of Darwin. To those who do not understand French, these works are now available in their entirety by the English translation.

To the entomologist of the old school who studies nature for the wonders of her works rather than for the shekels which are now offered to a professional student, these volumes will prove a delight, which we believe, has never before been equalled in the realms of science. Nor should they be neglected by the professional who will discover in their contents, details in observation in methods of study and in habits that must prove of great value even to the most proficient.

It is, perhaps, enough in this short notice to say that these works are teeming with facts presented in a manner that only a Frenchman seems capable of, and this lucidity seems to have been fully maintained by the translator.

These works are, to all intents and purposes, without technical language and deal with a great range of subjects as will be noted from the following titles already published: "The Life of the Spider",

"The Life of the Fly", "The Mason Bees", "Bramble Bees and Others", "The Hunting Wasps", "The Life of the Caterpillar", "The Life of the Grasshopper", "The Sacred Beetle and Others".

To review such a remarkable series of works in so short a space is impossible nor has it been attempted. It is enough to say that under each title are provided the life habits of many different insects told with a charm that turns the tedium of ordinary technical science into the wonders of a fairy tale, and yet in the transformation does not at all overstep the realms of truth.

These writings should prove a source of delight alike to the young and grown-ups, and for the parents who wish to instill a knowledge of nature into their children, free from the too common imaginary teachings of to-day, we know of no books that should prove more suitable or more readable, than those of J. Henri Fabre.—N. C.

KEY TO THE ROCKY MOUNTAIN FLORA, by P. A. Rydberg, Ph.D., Curator, New York Botanical Garden: Published by the author; price $1.60 post paid.

When Dr. Rydberg published his "Flora of the Rocky Mountains and Adjacent Plains," which was reviewed in "The Ottawa Naturalist" a year ago, field botanists immediately felt the need of something less bulky than a large volume of more than 1,100 pages. Dr. Rydberg has now filled this want in a manner that will please and satisfy both field and herbarium botanists. The recently published Key is a reprint in a somewhat different form of all the keys published in the Flora, and these keys with an excellent glossary and index make a handy little volume of 306 pages of 5x8 inches and less than half an inch thick which can be carried in any ordinary pocket. The Key may in this way be used independently of the Flora and fresh growing specimens be studied before they are collected. Another use to which the Key can be put is in the listing and checking of local floras, an initial letter or some arbitrary sign being used to indicate particular localities, countries or provinces. As the Key covers not only the flora of the Rocky Mountains, but also that of the provinces of Albert and Saskatchewan and the Kootenay Districts of British Columbia, it should be in the hands not only of all western botanists but of all schoolteachers, ranchers, farmers and others who are interested in knowing the names of the flowers which grow near their homes.—J. M.



(The April issue was mailed on July 3, 1919.)

THE CANADIAN FIELD-NATURALIST

VOL. XXXIII. SEPTEMBER, 1919. No. 3.

NOTES ON CANADIAN WEASELS.

By J. Dewey Soper.

The Least Weasel, *Mustela rixosa* (Bangs).

This diminutive carnivore is doubtless the least known of the North American weasels. About fifteen records all told, mostly from Canada, indicate both our limited knowledge and the scant possession of scientific material relative to the species. Since 1857 when Baird first described the species, data concerning its life history has accumulated slowly and even yet is of very limited extent.

The range of *rixosa*, according to Seton[1] extends in a broad band, roughly, eight or nine hundred miles in width diagonally across the continent from Montreal and the south-western extremity of Lake Superior to Alaska. As a boreal species it is restricted to the Arctic, Hudsonian, and Canadian life zones. In north-western Alaska a race of this species *P. eskimo* (Stone) is recognized, also what may prove to be a race is Rhoads'[2] *allegheniensis* from Pennsylvania. Thus, theoretically, southern Ontario comes within the range of the Least Weasel, but I know of no records from the region.

The Least Weasel is not only the smallest of the weasels, but is the smallest known beast of prey in the world.

In summer, the upper parts including the tail are of an even light brown color, the under parts being pure white. The winter coat is entirely white. The tail is very short and lacks at all seasons the black tip.

As a carnivorus animal its diminutive proportions may be better appreciated when compared with a mouse for instance. The Least Weasel habitually preys on mice, but exceeds them but little in size. A glance at the following measurements of *rixosa* will reveal slight difference in this respect from the genus *Microtus*, the meadow mice, etc.

Total length about 6½ inches (166 mm.); tail vertebrae, 1¼ inches (32 mm.); hind foot, 13-16 inches (21 mm.)

Measurements of a large meadow mouse *(M. pennsylvanicus)* taken Feb. 17, 1918, coll. No. 243, male: Length, 168 mm.; tail, 50 mm.; foot 21 mm.

It will be noticed that the latter is the largest, but this one was of more than ordinary size.

The only place I ever came into contact with the Least Weasel is Edmonton, Alta., and even there where weasels are common only one was taken within a certain period of time, during which about one hundred and fifty of the other species were captured. This fact indicates its rarity in that region.

I found it about Nov. 13 in one of my traps, along the White-mud river, a few miles south-west of the city. It was pure white, proving it takes on its winter pelage as soon as the other species.

The locality in which it was collected was that ordinarily frequented by *M. cicognanii* and *M. longicauda*—meadow-like river-tracts sparsely overgrown with poplar. The first sight of its body made me think of an Albina meadow mouse. Even such small mammals sometimes spring the larger traps as all trappers know. To those who are unfamiliar with the many disappointments of the trap line, it may be said that after repeated failures at certain "sets" when bait disappears and traps are mysteriously sprung, a crushed shrew or deer-mouse in the jaws will at last dispel the mystery.

The Long-tailed Weasel, *Mustela longicauda* (Bonaparte).

This species, the largest of our Canadian weasels, should not be confused with others of the family. Great strength for its size is suggested in the muscular contour of its make-up. The legs are comparatively short and stout, the body compact and very muscular, and the head massively formed in alliance with its other physical proportions.

In size it approaches that of a small mink and in summer coat with hasty glance might be mistaken for one. In winter, as Seton remarks, it could easily be mistaken for a big white squirrel, that is, upon the ground. It has a closest resemblance to *M. noveboracensis* but as the range of the two species do not coincide and as extra limital occurrences are rare, little or no confusion should be experienced in the field.

[1]Seton, E. T., Life Hist. of Northern Animals. Vol. II, p. 861, 1909.

[2]Rhoads, S. N., Mamm. of Penn. and N.J., pp. 173-176, 1903.

Except for one extra limital record by Miller[3] for North Bay, the species has only been found in Canada broadly coincident with the prairie conditions of the western provinces of Manitoba, Saskatchewan, and Alberta; in the south-western portion of the former and north to 55° in the two latter. In the United States its range is south to Kansas. While it is generally recognized as a prairie dweller, the poplar forests skirting the prairies harbor great numbers, as do also to some extent the darker coniferous areas. Probably the latter fact is not generally accepted. I have personally, however, frequently collected the species about the city of Edmonton. The immediate region comprises conditions peculiar to the north-west, such as the occasional grass or prairie lands, the poplar woods of the upper country, and the deep river basins and ravines which are comparatively heavily timbered. Over all such areas around Edmonton the long-tail ranges indifferently.

In summer the species over the upper parts is pale yellowish-brown, the under parts rich ochraceous or buff yellow. The winter fur is pure white. The tail is one-third the length of the animal and the black tip one-quarter of the length of the whole tail.

Measurements as given by Seton[4]: Length about 18 inches (457 mm.); tail 6 inches (152 mm.); hind foot 2 inches (51 mm.) Female about one-seventh smaller.

With the short-tailed species, *M. cicognanii*, the Edmonton region is favorably endowed. In winter their delicate paired tracks may be seen nearly everywhere. *M. longicauda* occurs in a ratio of about one to ten of *M. cicognanii*. Under the discussion of the latter I have placed my estimate on the general and specific numbers of all the weasels found around Edmonton.

Along the Saskatchewan river numerous deep wooded ravines open out upon the valley. Within these, probably induced by a greater abundance of game in winter, a goodly number of weasels, or ermine as they are called, make their daily rounds. The spaces under the spruces and the open runs of the little frozen streams are usually at very frequent intervals indented with the innocent-looking trails. Hither and thither they lead, under windfalls and logs, through tangled growths, into crevices or other surface openings, etc. A blood-flecked hollow reveals the tragic end of a little deer-mouse; probably at a grassy margin a meadow vole. In a sheltered hollow a huddled hare has provided a sumptuous feast for days. And so all through the bitter weeks until nature fans the land with vernal breezes, the great white page is written again and again with signs of frolic or grim tragedy that spells life or death.

Bordering the White-mud river which flows into the Saskatchewan about two miles south-west of Edmonton I found the favorite hunting grounds of *longicauda* in the meadow-like areas on both sides. On these miniature alluvial plains in the concavity of the bends now grown to grass and scattered poplars, the weasels bounteously fared on the numberless population of shrew, mice and rabbits. Such places always suggest good weasel grounds.

NEW YORK WEASEL, *Mustela noveboracensis* (Emmonds).

In comparison with other weasels this species has a relatively restricted range within which also occurs *Mustela cicognanii*. In some sections it yields in numbers to the latter, but in other areas entirely replaces it.

The range of this species is approximately within the area bordered by an imaginary line drawn from the southern New England States, south to the Carolinas, west to the Mississippi, north to Georgian Bay, and east to Montreal. Within such area it is confined to the Canadian, Transition and Upper Austral zones.

The summer color of *M. noveboracensis* is dark brown above and white below, sometimes tinged with sulphur-yellow. In Ontario the winter coat is pure white, excepting sometimes a slight xanthic tinge on the belly, buttocks and tail. The latter is one-third of its total length and the terminal half is black (at all seasons). By this character it may readily be distinguished from *M. longicauda*, but as the range of the two species do not coincide, it will not be needed as a field mark.

The following measurements of this species are given by Rhoads[5]: Total length, male 405 mm. (16 ins.), female, 325 (12¾ ins.); tail vertebrae, male, 140 (5½ ins.), female, 108 (4½ ins.); hind foot, male, 47 (1¾ ins.), female, 34 (1¼ ins.)

In the counties of Wellington and Waterloo, of the province of Ontario, I have found this species to be much less common than *M. cicognanii*. Brooks as recorded by Miller[6] saw weasels at Milton much larger than the latter. The species, I think, would scarcely be other than *M. noveboracensis*. Mr. W. E. Saunders, of London, Ont., has informed me that the New York Weasel is the form occurring there, and that it is common throughout the western part of the Ontario peninsula.

By a peculiar coincidence the first weasel I ever trapped in Ontario was this species. This was near

3Miller, Jr., G. S., Mammals of Ontario, Vol. 28, No. 1, 1896.

4Seton, E. T., Life Hist., N. Animals, Vol. II, p. 865, 1909.

5Rhoads, S. N., Mammals of Penn. and N. Jersey, p. 172, 1903.

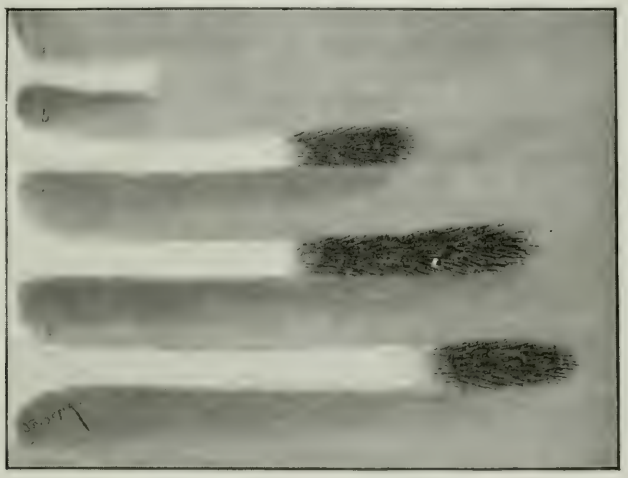
6Miller, Jr., G. S., Mammals of Ontario, Vol. 28, No. 1, p. 44, 1896.

Rockwood. Since, I have taken numbers of the Lesser Weasel, but only, I think, two or three of the large kind. The capture of the one mentioned was purely accidental and happened in November. The seasonal change to white is not always affected by this time. Some specimens taken near Christmas time when snow was on the ground still had a few belated brown hairs over the back. Contrary to this, individuals of spotless white are occasionally taken when no snow exists. The moult from brown to white or the reverse does not seem to depend on any particular seasonal change or condition.

I recall a story told me years ago by a farmer which portrays nicely the intrepid nature of this animal. While working in the fields he heard high overhead the strident calls of a hawk. Their unusual quality attracted his attention as well as the peculiarity of the actions accompanying them. Watching, he noticed the bird pass through some unusual gyrations, steady itself a moment and then come pitching to the earth, tumbling and turning. The man ran rapidly to the spot where the hawk fell and was just in time to see a brown weasel leap from the feathers and disappear in a near-by fence. From some concealed position it had doubtless leaped upon the feeding hawk and being lighter was instantly borne high into the air. In bull-dog fashion once having a grip it continued to work deeper and deeper until a fatal spot was reached.

An interesting note by John F. Carleton, East Sandwich, Mass., entitled "Bold Mother Weasel Rescues Young" (January, 1919, *Field and Stream*) illustrates again the venturesome spirit. He says: "Some years since I was at work with my man on the edge of a dry swamp, on high land, one-eighth of a mile from Bay Shore, when I found a weasel's nest with four half-grown young in a brush heap. I regret that I cannot recall the composition of the nest. I sat down 'side-saddle,' took up the four young and placed them in the outside left breast-pocket of my coat, my man standing near. Soon the mother appeared hunting for her young. I placed one on my knee; the mother soon scented it, jumped on my knee, grabbed the little one, and was off like a flash. I remained quiet and she soon returned to my knee, worked slowly along my leg and up my coat till she reached the pocket, pulled out another little one, and dashed away with it. As I was not willing to give up the others, I did not experiment further. I took them home, but the folks objected so to the odor that I was obliged to kill them. I have several times seen weasels very bold, but nothing to equal this experience."

Mr. E. T. Seton[7] cites an instance of an old weasel *(noveboracensis)* accompanied by five young ones about half-grown on June 28 near his home in Connecticut. These were evidently older than the other ones, which were still in the nest. On



TAILS OF WEASELS (WINTER FUR)—ONE-HALF NATURAL SIZE.

a—Putorius rixosus.
b—Putorius cicognanii.
c—Putorius noveboracensis.
d—Putorius longicauda.

[7]Seton, E. T., Life Hist. of Northern Animals, Vol. II, p. 848, 1909.

June 1, 1910, north-east of Guelph, Ont., I saw a weasel carrying a young one in its mouth as it followed along the bottom of a fence leading from a strip of woods. This individual may have been *M. cicognanii*.

SHORT-TAILED WEASEL, *Mustela cicognanii* (Bonaparte).

The Short-tailed or Bonaparte's Weasel is the most abundant species in Canada. Its numbers like other mammals of course are very variable as regards locality. Under favorable conditions *M. cicognanii* usually claims first notice throughout its range; the latter, including that of its closely allied races, covers almost the entire Dominion from coast to coast. Its range in the United States is governed by the boreal conditions existing in the Canadian and Upper Transition zones.

The summer color above is much like *M. longicauda*, a warm brown; under parts white, but sometimes tinged with sulphur-yellow. In winter the fur is pure white with a slight xanthic diffusion on tail, rump and hind legs. This stain is thought to exude to some extent from the odorous glands situated at the base of the tail. The latter is one-third its total length, and the black tip one-third the length of the tail.

Measurements of *M. cicognanii:* Total length about 11½ inches (292 mm.); tail vertebrae, 3¾ inches (95 mm.); hind foot, 1½ inches (38 mm.)

The female is considerably smaller, probably as much as one-fifth.

With the exception of the narrow belt of the Upper Austral zone above Lake Erie, this species ranges over the entire province of Ontario. It is common in the counties of Wellington and Waterloo. In a recent letter, Mr. Saunders informs me that he had no record of this species from London or the western part of the peninsula, but has skins from Durham and Ottawa, and a record by Hobson from Woodstock.

Winter is the time when this weasel is most in evidence. The dainty paired tracks may be seen in the snow about fences, log heaps, wind-falls, etc., representing vividly the wanderings of the night. In this the weasel is absolutely tireless, and withall, a very eager hunter. The white fur renders it almost invisible; except for the black tip on the tail it might bound by unseen.

The ermine trail may easily be distinguished from that of all other animals by its size in conjunction with the symmetry of its paired tracks. The mink trail is similar, but very much larger. The hind feet register almost, if not exactly in the front-foot impressions, with the right front and hind feet lagging slightly behind. The sequence of tracks with a bounding animal is not as regular between individual impressions as that of a running or walking animal, due to the variation in the length of jumps from time to time. The ermine being a bounding animal leaves a wide range of space lengths between imprints. The distance normally is about 19 inches, representing a regular rate of travel. The "jumps," however, depend entirely upon the mood, purpose or demands of the traveller. Sometimes they are no further apart than 6 or 8 inches; obviously the ermine is slowing down for more acute observation, scents prey or some similar reason. In traversing open spaces they resort to long, graceful leaps upwards of six feet in length. On January 5, 1919, I measured a record for *M. cicognanii*, a remarkable jump of 8 feet, 2 inches. The larger species should naturally be able to exceed this, but whether they do no not I am unable to say.

For pure audacity, I have seen enough of this species to prompt his classification as a ring-leader. Weasel reputation is, however, I think, very largely exaggerated. In rural sections the animal is seldom discussed apart from the hen-roost, for it seems firmly impressed upon the population that every weasel, big and little, here or there, now or anytime, is by right, might and heritage a blood soaked villain of endless carnage. But then some reasoning would dispel that view. Unfortunately for the whole lot the evil of one jeopardizes all. Individual temperament in animals is probably quite as diversified as in human beings, wherewith due allowance should be made for individual exception. Weasels do stand on the aggressive, but only a few interfere with the farmer.

I remember a little incident that happened on a summer night a number of years ago. About ten o'clock an old mother hen covering a brood of chicks, near the house, began to cackle anxiously, becoming gradually more positive until in about five minutes she opened up with a whirlwind of vociferous hysterics, sufficient to arouse the soundest sleeper. I dressed hurriedly and with light invaded the troubled region, expecting to find a skunk *(Mephitis)* on a stroll with views and tastes similar to certain southern dwellers, but it was only a solitary little *M. cicognanii*. Three chicks had been killed and the remainder was under very active consideration.

At Edmonton they were very common during 1912-14. In two or three weeks each of two winters I trapped about sixty ermine over an area of not more than nine square miles. A great deal of this area escaped the trap in running the lines making it safe to discount one-third, leaving six square miles. I believe when I ceased operation that nearly as many remained free as were taken. Halving sixty for the one year and doubling for

the supposed original population we have ten ermine per square mile. I do not consider this figure in the least excessive for the wooded, northern portion of Alberta. That portion of the province, say from Edmonton to Fort Smith, would thus yield about 1,478,750 weasels. About one in every ten of this number would undoubtedly be *longicauda;* that is, one of the latter and nine *cicognanii* to the square mile.

North of Jasper Park on the Hay river during the fall of 1913 a friend and I in eight weeks' trapping for this animal, took about eighty skins. Whether these were all *M. cicognanii* or not I cannot now say. I queried this point under *longicauda.* As the territory trapped, up the valley of the Hay river, Fish creek, and other tributary streams, did not exceed thirty linear miles, one-quarter of a mile in width, we have only a total of eight square miles. Again this is ten weasels to the square mile, coinciding with the Edmonton figure, with this difference, however, that the number of the trapped animals is not doubled to indicate the probable total population. This is because over the restricted area of the valleys and the prolonged period of trapping I believe most of the weasels were taken. At Edmonton this was not the case. In the former instance, a certain influx of animals from adjacent areas may have occurred as the competitive influence was removed from the valleys, thus lowering the figure somewhat per square mile, but I do not think a weasel travels widely in a wooded country like western Alberta.

Many interesting experiences happen to a man in the woods. One day I travelled up a long dark timbered ravine that cut into the White-mud river south-east of Edmonton. At the base of a big spruce I had a "set" for ermine, which on inspection showed the bait stolen with some of it in the sprung trap. In a few minutes' hunting, another hare was secured with which to replace it. The meat being warm was no doubt exuding a tantalizing odor to furtive nostrils, for as I knelt at the trap, a faint rustle, like leaves in a light breeze attracted my attention. There was no wind, so I concluded that it was a shrew, but looking quickly, following a repetition of the sound, I saw a beautiful snow-white ermine silhouetted among the dark roots of a spruce not three feet distant. It eyed me for a while, head held high and nose a-quiver; then it disappeared. But the next moment back it came, followed by a rapid series of disappearances and reappearances. I then laid the rabbit near the roots and the intrepid little rascal ran out, bit into the meat and retreated. After doing this for a while he would pertly mount the rabbit's carcase with his front feet, draw one foot up under his breast as if it were cold and gaze me straight in the face. Ambition was now chasing away all discretion. His next move was to bite into the rabbit's ear and attempt its removal to the hole. The brave attempts following this consuming desire were indeed very commendable.

A year later near a mountain pass in Alberta a similar experience befell me, while I was setting a lynx snare. This time the ermine after watching me with beady eyes for a time, actually followed (though with caution) a piece of meat that I slowly pulled along the ground. It was not because of food scarcity that prompted this, for hares existed in plenty throughout the region that autumn.

Another time on Fish lake, in the same general region, I broke through the ice one early afternoon and to prevent frostbite was compelled to camp and dry out my clothes. Comfort was about restored as I sat dreamily gazing into the leaping camp-fire when something flashed just to one side of my line of sight and was gone. Looking, expecting to see a whisky-jack, as usual, I saw nothing, the silent wilderness apparently, excepting myself, without an atom of life. About to dismiss the matter as a trick of the sight, I saw an ermine bounding along among the trees, hesitating momentarily, but ever circling nearer, until on the very edge of the camp almost, he stood partly erect, daintily folding one foot along his breast and surveyed the scene for several seconds. He circled the camp a number of times, darting here and there venturing now close, then retreating, bolting under roots, into holes, and over open spaces until I suppose his curiosity was fully satisfied. Then I saw him no more. There is a strange fascination in thus sitting silently in a great solitude, fleetingly viewing a bit of its wild life, open, free, unsuspecting, though usually occult and mysterious.

AN UNRECOGNIZED SUBSPECIES OF MELANERPES ERYTHROCEPHALUS.

BY HARRY C. OBERHOLSER.

There is in the west central United States and adjacent portion of Canada an unrecognized subspecies of *Melanerpes erythrocephalus*. Mr. Ridgway, years ago, called attention[1] to the difference in size and color between specimens of this species from the eastern United States and those from the region of the Great Plains and the Rocky Mountains, but made no subspecific separation on account of the more or less intermediate character of the birds from the Mississippi valley. A recanvass of the matter, however, shows that the bird from the Great Plains and the Rocky Mountains is subspecifically distinct and therefore deserves recognition in nomenclature. It has an available name, however, as we shall explain, and should stand as MELANERPES ERYTHROCEPHALUS ERYTHROPHTHALMUS, *subsp. restit.*

Melanerpes erythrophthalmus Silloway, Bull. Fergus County Free High School, No. 1, 1903, p. 36.

Chars. subsp.—Similar to *Melanerpes erythrocephalus erythrocephalus*, but decidedly larger; abdomen more strongly tinged with yellow, and more often with red.

Measurements.—Male:[2] wing, 142-149.5 (average, 145.6) mm.; tail, 72.5-81 (77.1); exposed culmen, 26.5-28; tarsus, 22.5-24.5 (23.5); middle toe without claw, 17.5-19 (18.2).

Female:[3] wing, 140-144 (average, 142.6) mm.; tail, 74-84.5 (78.1); exposed culmen, 27-30 (27.8); tarsus, 20.5-24 (22.2); middle toe without claw, 18-19 (18.4).

Type locality.—Lewistown, Fergus County, Montana.

Geographic distribution.—West central United States and adjacent portion of Canada. Breeds north to southern Manitoba, southern Saskatchewan, and southeastern British Columbia; west to southeastern British Columbia, central Montana, central Wyoming, and central Colorado; south to northern New Mexico, northwestern Texas, and southern Oklahoma; and east to central Oklahoma, central Nebraska and eastern North Dakota. Casual in northern Utah and southeastern Arizona.

Remarks.—Size is the best and most reliable character for distinguishing this subspecies.. The following measurements of *Melanerpes erythrocephalus erythrocephalus* from the central eastern United States will facilitate comparison with those of *Melanerpes erythrocephalus erythrophthalmus* given above:

Male:[4] wing, 134.5-145 (average, 138.1) mm.; tail, 70.75.5 (73.2); exposed culmen, 25-29 (26.4); tarsus, 22-23.5 (22.6); middle toe without claw, 17-18 (17.4).

Female:[5] wing 133.5-138.5 (average, 135.6) mm.; tail, 72.5-77 (74.5); exposed culmen, 25-26 (25.4); tarsus, 21-22 (21.7); middle toe without claw, 17-18 (17.4).

The color differences between these two races of the red-headed woodpecker, while of value in subspecific characterization, are not constant enough to be of much use in the identification of individual specimens. The depth of the yellow tinge on the abdomen, while appreciable in a series, is in individual specimens often the same in both forms, while a more or less evident tinge of red on the abdomen is present is only 20 of 31 adult specimens of *Melanerpes erythrocephalus erythrophthalmus;* while of 40 examples of *Melanerpes erythrocephalus erythrocephalus* from the eastern United States, 9 show more or less evidence of red. In fact, one example from Fort Meade, Florida (No. 78253, U.S. Nat. Mus.), taken in June, 1879, has as much red on the abdomen as any western bird that we have examined.

Mr. Ridgway suggested[6] that if a Great Plains race of this species were to be separated, the Mississippi Valley bird should be treated likewise because of its similarity in color to the birds from the Great Plains and its corresponding difference from those of the eastern United States. As we have shown above, the differences in color between the eastern and the farthest western birds is scarcely constant enough to serve for their recognition in absence of any other character; furthermore, of 31 adults from the Mississippi Valley, only 17 have any red tinge on the abdomen, though practically all have a more or less strong buffy suffusion. This, in view of the fact that about one-fourth of the eastern birds have at least an indication of red on the abdomen, shows clearly that there is here no color difference by any means constant enough for the subspecific separation of the Mississipppi Valley birds from those of the eastern United States, or from those of the Great Plains. As will be seen, however, they are, in this average color character of red on the abdomen, somewhat nearer *Melanerpes*

[1]Bull. U.S. Nat. Mus., No. 50, pt. VI, 1914, p. 43.
[2]Ten specimens, from Colorado, Wyoming, and South Dakota, measured by Mr. J. H. Riley.
[3]Six specimens, from Colorado, Wyoming, and Oklahoma, measured by Mr. J. H. Riley.
[4]Ten specimens, measured by Mr. J. H. Riley.
[5]Five specimens, measured by Mr. J. H. Riley.
[6]Bull. U. S. Nat. Mus., No. 50, pt. VI, 1914, p. 43.

erythrocephalus erythrophthalmus; but since they are practically the same in size[7] as typical *Melanerpes erythrocephalus erythrocephalus*, they are to be referred to that form.

Birds from Mount Scott, in south central Oklahoma, belong undoubtedly to the western race, as do also birds from central New Mexico, and breeding birds from the Panhandle of northwestern Texas.

Red-headed woodpeckers from Minnesota are rather large and frequently have red on the abdomen, but appear to be, as a whole, nearer the eastern form. All the specimens from Texas examined, except those from the northwestern portion, belong to the typical eastern bird.

By the segregation of the present subspecies the range of *Melanerpes erythrocephalus erythrocephalus* becomes restricted to the following area:

Eastern United States and southeastern Canada: north to New Brunswick, southern Quebec, and southern Ontario; west to Minnesota, Iowa, Missouri, Arkansas, and central Texas; south to southeastern Texas, southern Louisiana, and southern Florida; and east to the Atlantic coast of the United States and New Brunswick. Casual in Nova Scotia.

The technical name to be used for the western red-headed woodpecker involves an interesting complication. In an annotated list of the birds of Fergus County, Montana, Prof. P. M. Silloway enters this species as follows:[8]

"406. RED-HEADED WOODPECKER, Melanerpes erythrophthalmus.

This handsome woodpecker occurs sparingly in the wooded coulees near Lewistown, which is certainly near the western limit of its distribution. On several occasions I have seen it along Big Casino, where it breeds. On June 9, 1903, I noted the presence of the red-headed woodpecker at Cottonwood. Dr. J. A. Allen states that the red-headed woodpecker was abundant everywhere from the Missouri to the Yellowstone, far outnumbering all the other Picidae together. It is migratory in this portion of its range, making its appearance about the middle of May, and beginning to nest early in June.

Distinguishing features: Head, neck, and upper part of body crimson; middle of back across, bluish-black; other parts white; length 9-10 inches."

The name *Melanerpes erythrophthalmus* is apparently a lapsus calami for *Melanerpes erythrocephalus*, and there is no other evidence that the author intended to describe a new species or subspecies. The name *Melanerpes erythrophthalmus* does not occur in the index, but the species is duly entered there[9] as *Melanerpes erythrocephalus*. If no description had been given, the name *Melanerpes erythrophthalmus* could have been regarded as a nomen nudum; but it is validated by the addition of the perfectly recognizable description, for it certainly can not be called a typographical error; therefore, according to the rules of nomenclature, it must be applied to the form of red-headed woodpecker occurring in its locality, now that this is found to be different from typical *Melanerpes erythrocephalus*. Its type locality is, of course, Fergus County, Montana; furthermore, since Lewistown is the first definite place mentioned we may legitimately select this as the restricted type locality. The original description of *Melanerpes erythrocephalus*[10] was based on the bird of South Carolina, so that this name is, of course, properly applicable to the eastern race.

The specimens of this newly recognized race examined are principally in the United States National Museum, including the collection of the Biological Survey, but additional examples seen are in the Museum of Comparative Zoölogy, the American Museum of Natural History, and the Field Museum of Natural History. The writer is further indebted to Mr. Charles B. Cory for data in regard to specimens in the collections under his charge. The 46 specimens of *Melanerpes erythrocephalus erythrophthalmus* examined are from the localities given in the subjoined list.

Colorado.—Denver (June 5, 1874); Bear Creek (June 7, 1873); Pueblo (July 23, 25, and 28, 1874); Fort Lyon (May 16 and 19, 1883); North Fork of South Platte River (July 12, --); Kettle Creek (August 6, --); Huntsville, August 7, --).

Kansas.—Hart's Hill, east of Fort Riley (June 13, 1856).

Montana.—Custer's Creek (August 1, 1873); near old Fort Sarpy (August 9, 1873); Big Bend of Musselshell River (August 24, 1873); Sun River (September 5, 1867); 5 miles southeast of Ekalaka (May 31, 1916); Crow Agency (August 5 and 6, 1916); Little Missouri River, 8 miles north of Capitol (June 3, 1916); Pilgrim Creek, 8 miles northeast of Broadus (June 12, 1916); Darnall's Ranch, Dawson County, 30 miles south of Glasgow (June 28, 1910; July 1, 1910); Zortman (July 28,1910).

Nebraska.—Valentine (September 8, 1891).

New Mexico.—Bear Canyon, Raton Range (September 10, 1903).

North Dakota.—Valley City (June 25, 1912);

[7] Cf. Ridgway, Bull. U. S. Nat. Mus., No. 50, pt. VI, 1914, p. 43.

[8] Bull. Fergus County Free High School, No. 1, 1903, p. 36.

[9] Ibid., p. 75.

[10] [Picus] Erythrocephalus Linnaeus, Syst. Nat., ed. 10, I, 1758, p. 113 (southern South Carolina; based on Catesby, Nat. Hist. Car., Florida, Bahama Is., I, 1743, p. 20, pl. XX.)

Medora (June 16, 1913); Cannonball (August 16, 1915).

Oklahoma.—Kiowa Agency, 17 miles southeast of Fort Cobb (April 1, 1868); Mount Scott P.O. (March 26 and 27, 1904).

South Dakota.—Custer County (July 7, 1894); Corral Draw, Pine Ridge Indian Reservation (May 16, 1894).

Texas.—Vernon (April 30, 1894).

Wyoming—Deer Creek (May 21, 1877); Fort Laramie (May, 1864; May, 31, 1878); Black Hills (August 3, 1856); Saratoga (June 4, 1911); Greybull (June 8, 1910).

NOTES ON SOME OF THE FISHES OF ALBERTA AND ADJACENT WATERS.

By F. C. WHITEHOUSE, RED DEER, ALTA.

Owing to the fact that ichthyology has never apparently appealed to amateur naturalists to any great extent, the general knowledge respecting our fishes is infinitely less than that concerning our birds, mammals, flora and at least two orders of insects. This surely should not be in a country like Canada, blessed with fresh water fishes to the extent that they constitute a very important factor in the economic wealth; not to mention the sport and outdoor recreation they provide to a very large number of enthusiastic fishermen. In spite of their enthusiasm, however, I find that most sportsmen are lamentably ignorant concerning their catches, and in speaking of trout for instance, either generalize in calling everything "speckled-trout," or go to the other extreme and specify "Brook trout" or "Rainbow trout," neither of which species occurs in this section of Canada—unless of course the imported "Brook trout" of the Mountains Park be included.

While disclaiming any specialized learning in the science of ichthyology, I contribute the following notes for the purpose of correcting errors in the recorded range in the case of three well known fishes, and I hope clearing up a few mistaken ideas in the minds of some who may know even less than myself upon the subject.

The list is arranged according to the "Check List of the Fishes of the Dominion of Canada and Newfoundland," which laudable work will be hereinafter alluded to as the "Government Check List."

ACIPENSERIDAE.

41. *Acipenser transmontanus* Richardson. White Sturgeon.

Sturgeon are but rarely captured in Alberta. Three or four years ago, however, a very fine specimen was taken in the C.P.R. dam (Bow river) at Bassano, and since the Bow and Belly rivers join to become the South Saskatchewan river, and *transmontanus* is recorded from the latter waterway, the Bassano fish must presumably be referred to that species. On the other hand *A. rubicundus* (Lake sturgeon) is also recorded from "Lake of the Woods and Prairie Provinces" so it is clearly unsafe to jump to conclusions.

HYODONTIDAE.

52. *Hyodon chrysopsis* Richardson. Western Goldeye.

While the Government Check List gives "Provinces of Manitoba and Saskatchewan" as the range of this fish, it is certainly common in Alberta in the Red Deer river. It was also one of the fishes recorded by Mr. Fletcher's survey party, 1916, "Peace river." I do not doubt but that it is common in both branches of the Saskatchewan river.

Goldeyes usually average rather less than one pound, but they are frequently taken up to 18 ounces. I was informed of a specimen fish taken at the junction of the Blindman river and Red Deer river two years ago, the weight given being two pounds. This fish rises nicely to artificial flies, and on a light rod puts up an excellent fight. It is an insect feeder, "whirl a gig" beetles forming an important item of its diet. Under normal water conditions Goldeyes feed all over the river, but in times of flood seek the less muddy water in the mouths of tributary rivers and creeks, when they can be taken in numbers with various baits such as worms, grasshoppers, meat, etc.

In Manitoba there is a small industry in kippering Goldeyes, and both from an economic and sporting point of view an increase rather than diminution of these fishes is desirable.

SALMONIDAE.

67. *Coregonus williamsoni* Girard. Rocky Mountain Whitefish.

This fish occurs throughout Alberta and British Columbia in rivers and lakes, but I have no first hand knowledge concerning it. In the interesting and useful little booklet, "Classified Guide to Fish and Their Habitat in Rocky Mountains Park" by Mr. S. C. Vick, published by the Dominion Parks Branch, Department of the Interior, 1913, the author states that *C. williamsoni* "is found in almost all the park lakes and streams," and both in the text,

and below the illustration, gives the species the alternative common names of Rocky Mountain Whitefish or Grayling—which, of course, places it simultaneously in two different genera. In the Raven and Clearwater rivers, west of Red Deer, so-called "Grayling" occur, and have been taken by fishermen for years past. Whether these are really Rocky Mountain Whitefish I cannot state, but I am confident that many of the "Grayling" catches are so only in the minds of their captors.

73. *Coregonus labradoricus* Richardson. Labrador Whitefish.

Whitefish occur in Lake Wabuma, west of Edmonton, and in fact in many of the lakes of northern Alberta. If the facts are as stated in the footnote (Jordan and Everman) in the Government Check List, however, the whitefish of commerce in the prairie provinces is *labradoricus*, and not *clupeiformis* the common whitefish of the Great Lakes.

89. *Oncorhynchus kennerlyi* Suckley. Kennerly's Salmon: Little Redfish.

I have no personal knowledge concerning this species. Through the kindness of Mr. J. W. Cockle, of Kalso, B.C., I am able to give the following data:

"This diminutive salmon is found in all the waters of the interior of British Columbia. It runs up the creeks to spawn in the fall and is taken with nets and by spearing and salted down for winter use by many of the settlers. The fish is sometimes taken in Kootenay lake when trowling for salmon and forms the main diet of both salmon and char which inhabit these waters. It runs up from the Columbia river into Christina lake and spawns there on the shallow shores at the south end of the lake; large numbers are taken there every season."

93. *Salmo clarkii* Richardson. Cut-throat Trout.

This fish is most aptly named since there is a red streak on the throat on either side. It occurs in the clear rivers of Alberta and in the mountains in streams and lakes. The Cut-throat trout rises very well to artificial flies, and is a game fighter. In bodies of water of high altitude such as Consolation lake near Lake Louisa, etc., and mountain creeks, *clarkii* does not frequently exceed one pound in weight, but at lower altitudes runs from three to four pounds.

The author of the "Classified Guide," already referred to, suggests that mature fish cannot negotiate the small mountain creeks and that inbreeding results. The lakes are not inaccessible to small fish, however, and as new blood is thus introduced I do not think inbreeding is the explanation. The temperature of the high altitude lakes is intensely cold—42 or thereabouts—and I personally incline to the opinion that the rigors of the habitat is responsible for dwarfing—a theory supported to some extent by insect life under alpine conditions.

95. *Salmo rivularis kamloops* Jordan. Kamloops Trout.

My experience of this fish is confined to the Kootenay lake at Kaslo, B.C., where it is taken on rod and line with a large spoon. Local fishermen use about 600 feet of thin line, and run the spoon say 300 feet from the boat. The fish in its fight breaks water like an Atlantic salmon. I quote, in addition, from a recent letter from Mr. J. W. Cockle, of Kaslo:

"A native of Kootenay and Okanagan lakes; when mature, large fish of both genders are slivery with a very faint tinting of pink over the gill coverts; attains a weight of over 20 pounds, but the usual size of mature fish is about 12 to 16 pounds. Nothing is known of its spawning habits, but it is usually taken about the end of May and during June at which time it is in prime silvery condition."

() *Salmo rivularis kamloops?* (By Mr. Cockle and the present author).

The fish I now refer to is the species commonly (and of course erroneously) called the "rainbow trout" by fishermen. I have taken the fish at Kaslo on a spoon up to 12 pounds, and at, or rather below, Boddington Falls, B.C., up to 3½ pounds on artificial fly. It is a very game fighter, and a beautiful fish in appearance—the sides being streaked with an iridescent sheen. Mr. Cockle, of Kaslo, B.C., has had this species under observation for years and has consequently had ample opportunity to form a mature opinion as to its distinctness from the species next above. I quote from recent correspondence:

"A large salmon indigenous to Kootenay lake, which spawns on the upper waters of the Lardo and Duncan rivers just as they emerge from Trout and Houser lakes. It spawns during May and up to the second week in June, at which time the males are nearly black: specimens spawned at the Hatchery at Gerrard last season weighed 40 pounds, but the average spawning fish are about 16 to 20 pounds. When in prime condition during November they are a bright silver color, heavier spotted with black markings than the preceding, and have a bright pink band extending from the gill coverts along the sides. The back is a deep olive green in contradistinction to *S. kamloops* which is blue-black on the back. There also exist some very small varieties of this species which are to be found in mountain lakes; these attain a weight of about six ounces, but the identical with the above in habit and in also turning black when spawning. The late Dr. Starr

Jordan and other authorities could find no difference in the structure of these two varieties (i.e., *S. kamloops* and *S. kamloops* . . .?) but from the fact that the first is in prime condition at the same time that the other is spawning and has turned black, the writer has not a doubt of their distinctness, but until it is proved by breeding, the fact that they are two species will have to remain unproven."

98. *Cristivomer namaycush* Walbaum. Great Lake Trout.

Namaycush, generally conceded to be our most valuable commercial fresh water fish, inhabits the lakes of northern Alberta, and also, supposedly, Minnewanka lake, near Banff. While closely allied to the genus *Salvelinus* (Charrs) the teeth in the palate, or more correctly the vomeral ridge, easily serve to separate from that genus. To the best of my knowledge this fish will not rise to a fly at any stage in its life—a "spoon" or bait being the lures used by sportsmen. The commercial method is netting.

In the Classified Guide, already referred to, an illustration is given of a Minnewanka "*namaycush*"? but the body of the fish illustrated does not taper narrowly to the tail; the tail is not forked, and excepting for the large mouth, the figure depicts the genus *Salmo* rather than *Cristivomer* or *Salvelinus*. Of course the illustration may have been made from a faulty painting or cast, but a comparison of it with the excellent illustrations in the Government Check List, Fig. 46, 47, Plate VII, will explain why I state the Minnewanka lake fish is supposedly (?) *namaycush*.

100. *Salvelinus fontinalis* Mitchell. Speckled Trout: Brook Trout.

Disregarding the importations from Lake Nipigon to the waters of the Mountains Park, this species does not occur in western Canada. In spite of this fact, however, and as stated in the introduction to this paper, more bags of fish are designated "brook trout' 'or "speckled trout" by their proud captors than are named (or more probably misnamed) anything else. *Fontinalis* is unusually unhappy in the matter of its common names. If it is "speckled," so are all the other members of the family! If it inhabits "brooks," it thrives equally well, or even better, in lakes and rivers! It is not a *trout* but a *charr*. Notwithstanding everything, including the fact that the Canadian charrs otherwise will not rise to artificial flies, and are poor fighters, *fontinalis* is probably the sportiest and most popular fish in the world, and in the Nipigon river on the north shore of Lake Superior specimen fish run up to 10 pounds. Mr. Vick, in the Classified Guide, states that the imported fish in the Mountains Park have adapted themselves and that they are doing well. It is to be hoped that they are not doing so at the expense of the Cut-throat trout.

101. *Salvelinus parkii* Suckley. Dolly Varden Trout: Bull Trout.

()*Salvelinus* ? Silver Trout: Bull Trout.

In the Classified Guide to the fish in the Rocky Mountains Park, the author, Mr. Vick, separates *parkii*, the Dolly Varden trout, from the Silver trout which he designates "of the same species," but fails to supply us with a scientific name. If there are two Bull trout—and I incline to such view myself—Mr. Vick's dilemma is my own! Personally, I separate these charr chiefly by the sheen on the scales: the Dolly Varden is golden in appearance, whilst the Silver Charr is silvery. They both have pink spots, large mouths, and bodies that taper very much toward the tail. They will take any bait from a live or artificial minnow to a mouse or garter snake: are voracious feeders, but poor fighters. I have caught them from six inches long in the headwaters of mountain creeks, to six or seven pounders in the Red Deer river, and Kootenay lake, but they run up to 12 and even 14 pounds. They put in an appearance at the mouths of creeks tributary to the Red Deer river just as the ice is going out, and owing to the fact that they are native to waters unsuitable for the more delicate Salmos, are a valuable and interesting fish. I quote Mr. Cockle, of Kalso, B.C.

"Besides the large variety of this fish which is indiginous to the waters of Kootenay lake and reach the weight of 10 to 15 pounds and which go up the creeks during high water during June to spawn at the headwaters of the creeks, and which return again when the first snow water comes into the creeks, there is also a small variety which is practically identical, but which seems to stay up the creeks and mountain lakes at all times. These attain a weight of one-half to two pounds, and spawn during October, but whether they are the fry of the larger fish which spawns during the summer or are distinct can only be solved by the hatchery."

I have on several occasions been told of a fish that occurs in the lake at Sicamous Junction, B.C., and locally known as the "Silver Trout." From my understanding of the matter the Sicamous fish must not be confused with the Silver (charr) trout, above discussed.

109. *Thymallus tricolor montanus* Milner. Montana Grayling.

The absolute identity of the south Alberta Grayling does not appear to be established, but the Government Check List refers it to the above species. I have personally never seen an Alberta Grayling, but the curator of the Calgary Museum

(Basement, Supreme Court Building) two or three years ago showed me plaster casts of what he regarded as Alberta Grayling in contradistinction to casts of Rocky Mountain Whitefish, *Coregonus williamsoni*. I am not questioning, therefore, that a fish of the genus *Thymallus* occurs in the province, on the other hand I feel sure (as already stated under C. *williamsoni*) that no small percentage of the catches of "Grayling" taken by fishermen are Rocky Mountain Whitefish. If *T. tricolor montanus* possesses the characteristic long dorsal fin of the Grayling group—long in the sense that the fin occupies approximately one-third of the fish's back—it should be easily distinguished from any species in the Whitefish group.

SUCKERS, MULLETS, ETC.

We next come to the large group of fishes commonly known as "Suckers," including Mullets, Red Horse, etc., quite uninteresting to sportsmen, and unesteemed for the table, yet far from unworthy of study from an economic standpoint. Like many creatures of nature the "Sucker" group of fishes are not wholly bad, nor good! On the one hand they are evil, in as much as they are spawn-eaters of fish more worthy than themselves, and on the other their own myriad young provide food for the said fish of greater value. I have made no study of the local fishes of this group and therefore simply list several species which, according to the Government Check List, occur in the province:

CATOSTOMIDAE.

136. *Pantosteus jordani* Evermann. Mountain Sucker.
137. *Catostomus griseus* Girard. Gray Sucker.
138. *Catostomus casostomus* Foster. Northern Sucker.
140. *Catostomus commersonii* Lacépède. Common White Sucker.
147. *Moxostoma lesueuri* Richardson. Northern Red Horse.

MINNOWS, DACE, ETC.

The next group is closely allied to the last, and comprises a number of genera of small fishes, including minnows, dace, chub, etc. By fishermen they are esteemed as bait, and as food for larger and more valuable fishes they have their uses. Some of them at any rate are spawn-eaters—so like the Suckers they are both good and evil. I list a few that are recorded in the Government Check List as occurring in the prairie provinces:

CYPRINIDAE.

168. *Notropis jordani* Eigenmann and Eigenmann. Jordan's Shiner.
177. *Notropis hudsonius selene* Jordan. The Spawn Eater.
181. *Notropis scopifer* Eigenmann and Eigenmann. Prairie Minnow.
186. *Rhinichthys cataractae dulcis* Girard. Long-nosed Dace.
195. *Couesius dissimilis* Girard.
197. *Platygobio gracilis* Richardson. Saskatchewan Dace. (Government Check List, Flat-headed Chub).

A specimen that I forwarded in alcohol to Prof. Bensley, of the University of Toronto, was referred by him to this species. The fish is common in the Red Deer river in the vicinity of Red Deer. It inhabits the mouths of creeks and eddies along the shore, and can be taken with bait, worms, etc. It appears to be an insect feeder as I have had them rise to artificial fly. The little fish is round bodied; wide across the head between the eyes, and has an extremely long nose, with protruding upper lip or snout.

LUCIIDAE.

210. *Lucius lucius* Linnaeus. Common Pike (Western "Jack-Fish.")

The pike is probably as well known as any fish that swims, for it is widely distributed not only in North America but also in Europe, Asia, etc. It occurs all over the Province of Alberta in lakes and rivers, such as the Red Deer river, Saskatchewan river, Peace river, and away north to the delta of the Peace and Athabasca. While the pike is not regarded very highly by fishermen in North America, since, generally speaking, it is a poor fighter, although individual fish will occasionally be hooked that will put up quite a struggle, such fact depends very largely, in my opinion, upon the condition of the fish, and of the water. As a table fish it is decidedly in the second rank; at the same time it is of no small economic importance due to its wide distribution. In many districts in western Canada the pike is virtually the only fish that can be obtained to supply cheap food and change of diet for the inhabitants and to the Indians it has undoubtedly always been of very considerable value.

The name "Jack-fish," so frequently given to this fish in western Canada, is an interesting mis-nomer. In the language of old country fishermen, a "jack" is a small pike, say up to five or six pounds. The name signifies size, just as the term "parr" and "grilse" signify certain immature stages in the life of the Atlantic salmon. I suppose old country settlers, years ago, called the small pike "jack" until in the end it was mistakenly adopted as a proper name, and the Pike became a "Jack-fish" quite irrespective of its size.

I am not at all sure that there are not two species of pike in western Canada, but whether the doubt-

ful form I have in mind is *Lucius reticulatus*, the Green Pike of Eastern North America or some variety of that species I cannot say. My suspicions of two species is based on the shape of the head. The head of the Common Pike, *Lucius lucius* should, according to my views, show a protuberance or bulge over the eyes, while the other species or form has a head curving gradually from the tip of the snout to the dorsum. The latter fish is the poorer fighter.

GADIDAE.

286. *Lota maculosa* Le Sueur. Fresh-water Ling: Burbot.

The Fresh-water Ling or Burbot belongs to the Cod group of fishes, including the Cods, Sea Ling and Haddock, and it is the only member of its family inhabiting fresh water. The belly is much distended by the abnormally large liver—a characteristic of the cods.

This very interesting, though somewhat objectionable-looking fish, is common in sluggish rivers and lakes in Alberta: Sylvan lake, Red Deer river, Peace river, etc. It attains considerable size, sometimes I am told up to 40 pounds. The flesh is white, it is comparatively free from bones, and it is a clean feeder, living, so far as I can discover on small fish. In spite of these facts, however, very few ling ever find their way to the table, for most fishermen, who catch them by chance, seem frightened of them. The liver and roe were esteemed as delicacies by the voyageurs, a statement I make on the authority of the Ontario Game and Fish Committee's Report of 1892.

Under normal water conditions this fish is extremely sluggish, and will lie on the bottom immobile for hours. As eels are affected by thunderstorms to unusual activity in search of food, so the fresh water ling in times of flood and muddy water, becomes a thing of action. The mouths of creeks are full of them seeking their prey—minnows and small fry. They hunt close to the bank and right on the surface, the locality always chosen by terror-stricken minnows seeking sanctuary up the creek. The gulps of the ling, sucking their prey into their spacious maws, is an unnatural and somewhat uncanny sound. My idea of the feeding habits are as follows: The fish, a strong but slow swimmer, is incapable of catching its prey by the chase. In clear water, therefore, it lies like a log, entices the small fry by means of the artificial "worm" provided by nature as an attachment to its chin, and without movement of body sucks in the intruder. In time of flood the muddy water provides concealment and "angling" is put aside in favor of the chase as explained above.

PERCIDAE.

315. *Stizostedion vitreum* Mitchell. Pike-perch (Old English), Pickerel (Canadian); Doré (French Canadian); Wall-eyed Pike (United States.)

While the Government Check List gives Saskatchewan as the western limit, probably most fishermen in Alberta know that this fish is common in some rivers in the province, and also in some of the lakes. The largest specimen fish taken by me (mouth Waskasoo creek, Red Deer river) weighed 8½ pounds, but some years ago at the mouth of the Blindman river, at Blackfalds, Mr. D. Gregson took a pair each of which weighed 12 pounds. In 1918, a Red Deer man caught a twelve-pounder at the mouth of the Medicine river, the weight of which I verified. The fish is not a great fighter, but fishermen esteem it because of its excellence for the table. The pickerel, when of mature age, is a shy fish and cunning. It has white eyes, like a wall-eyed horse, but excellent sight nevertheless. It will take a live or artificial minnow, a spoon, and a number of different natural baits, such as worms, frogs, mice, etc.

316. *Stizostedion canadense* C. H. Smith. The Sauger.

The name Sauger probably sounds strange, and I fancy that even to many fishermen the very existence of the fish is unknown. According to the text books it is similar to the pickerel, but seldom exceeds fifteen inches in length and has a rounder body. It has a black blotch at the base of the pectoral fins, and lacks the black blotch at the hinder part of the dorsal fin of the pickerel. The western range of this fish has not been clearly defined, and it will be interesting to determine definitely whether or not some of the small sized "pickerel" of the Red Deer river are not properly the Sauger. To date I have not been able to satisfy myself upon the point, as the position of black blotches is a very unsatisfactory characteristic upon which to separate two fish. Mr. Gregson, who has lived for many years at the mouth of the Blindman river, Blackfalds, claims that he can always tell what he calls a "Red Deer river pickerel" from the smaller fish taken between the mouth and the dam. In the former the black "perch bars" are more clearly defined. On the other hand these may simply be more mature fish, and I must leave the matter undecided.

317. *Perca flavescens* Mitchell. Yellow Perch: American Perch.

The Government Check List mentions Saskatchewan as the western limit of the perch in Canada.

As a matter of fact, however, Pine lake, south-east of Red Deer, is full of perch, averaging in weight about three to the pound. The fish also occurs in the reed-beds at Sylvan lake, the average weight being from half to three-quarters of a pound. The perch is a very fair table fish, and steps should be taken to prevent the wholesale slaughter that sometimes occur at Pine lake.

The foregoing notes include a number of species of our most interesting and valuable fresh water fish, and in concluding this paper I ask the question: Do we as a people sufficiently appreciate our heritage in fishes, and realize with the rivers and lakes of Canada at our disposal, the opportunities they offer (*a*) as food, (*b*) as a poor man's sport. Personally I do not think so upon the *broad lines* that I have in mind, and I feel, with a view to the generations to follow, that we should bestir ourselves. It seems to me the necessary procedure to be followed groups itself under three heads:

1. Continually restocking rivers and lakes with the *best* fishes *native* to such rivers and lakes—thus insuring an increase and not a diminution in the supply.

2. Introducing into river and lakes the *best* fishes *adaptable* (but not native) to such rivers and lakes.

3. Prohibiting by legislation the polution of rivers and lakes by untreated sewage.

NESTING OF THE CASPIAN TERN IN THE GEORGIAN BAY.

BY W. E. SAUNDERS, LONDON, ONT.

The Caspian is the largest of the three Terns which the observer has a reasonable right to expect to see on our waters. Until within a few years it was supposed that the only nesting ground of these birds in the Great Lakes was on some islands in Lake Michigan, and I was, therefore, quite surprised in June, 1909, when I found an adult specimen in the collection of Mr. Chris. Firth, at Durham. It was still more surprising to be told that this bird came from near Parry Sound where it nested on an island in that portion of the Georgian Bay.

This information had come from Adam Brown who is the lighthouse keeper at Red Rock light, five miles from the Limestone Islands on which the Caspian Tern has eventually been found to nest.

The summer following my discovery of this specimen at Durham, I had a letter from Prof. Guy Bailey, Geneseo, N.Y., inquiring where he could go for some interesting Canadian bird work, and I promptly detailed him for the hunt after the Caspian Tern which he carried out with entire success. He went to Parry Sound, made inquiry, and eventually landed on Limestone Islands, where he took photographs of the eggs and young.

I was not able to visit the locality until 1918, when on June 4, Rev. C. J. Young, Brighton, Ont., Mr. Edwin Beaupre, of Kingston, Ont., and I reached Parry Sound in the afternoon and went out with Mr. Dan Bottrill to Snug Island lighthouse, some distance past the entrance to Parry Sound bay. The next day being calm we traversed the intervening ten miles to the Limestone Islands. Caspian Terns were in evidence now and again on this journey and indeed, are tolerably familiar birds around Parry Sound harbor. When we came near the island we began to see them in considerable numbers and mingled with them were Herring and Ring-billed Gulls. The island on which the Caspians nest is only slightly elevated above the lake level with the exception of two places where mounds rise to the height of about ten feet above the lake. The chief mound, on and around which most of the nests are found, is perhaps thirty yards across at the base. The sides have a moderate slope and are covered with grasses, but the top of the mound is nearly bare of vegetation and the rock is breaking into small scaly fragments. The other mound is similar, but smaller, and the rest of the island, the northern one, is only slightly elevated above the level of the lake and more or less thickly covered with grasses.

Bare rock showed in a great many places in large irregularly formed rectangles and in the cracks between these rock faces grew the grasses which outlined them.

The two islands are connected at low water, but we had to wade from one to the other and it took us up to our knees and the footing was none too good at that.

On the southern island we imagined the nests of Kingbirds, Yellow warblers, Song sparrows, Tree swallow, Spotted Sandpiper and probably Black Duck or American Merganser as these birds were represented there, but there were no Terns' nests on it nor any gull's except those of the Herring, of which there were thirty or forty nests placed mainly between the timber logs which had drifted up from the low shores of the island and had been left high and dry by heavy winds.

Our interest centered, of course, on the Caspian Tern, and as usual in cases of communal nestings of

water birds, we found the different species keeping pretty well to themselves. The Caspian Tern selected for itself the highest portions of the island, namely, the tops of the two knolls. Here they rested when they came in from flight, and the fact that they always seemed to prefer to rest on the highest point probably accounts for the small number of nests on that part of the knoll. There were only five nests on top of the large knoll. On the sides were more nests of the Caspian Tern, but as the lower level was approached the nests of the Ring-billed Gull began to be found, and when the level at the bottom of the slope was reached, no more Caspians were to be seen. In addition to the five nests of the Caspian found on top of the large knoll, there were ninety-three nests on the sides of it. On the smaller knoll we found fifty-seven nests, making one hundred and fifty-five with eggs in all. It is to be presumed, therefore, that this colony consists of about 350 or 400 breeding birds, as many of the sets were incomplete and some of them had probably not yet begun to lay.

The habit of Terns in general is to make a very sketchy nest, often nothing more than a mere hollow, and the nests of the Caspian on top of the knoll followed this general rule, but as one observed the nests on the sides of the knoll, he found that as he went down the side, the nests became more and more substantial, until the bottom nests were almost as elaborate as those of the Ring-billed Gulls nesting alongside, and our surmise was that the higher levels were the preferred nesting ground for all species, and that the ring-bills started to lay their eggs on these higher levels but were ousted from them by the Caspians who adopted the more substantial nests of the gulls. The Caspians which were later in beginning to lay would then steal the nests of the next highest Ring-bills. This theory would account for the increasing thickness of the walls and lining of the Caspian nests as the lower levels were approached and the fact that the Caspians and the Ring-bills were nesting within three or four feet of each other in some places, also supports the theory. At one point at the south-east side of the larger knoll there was a clump of small bushes, in and around which were five nests. Three of these were Caspians and two were Ring-bills, one of these being in the centre of the patch.

It was very interesting to have these birds so close together and to compare their voices. The notes of the Caspian are, of course, unique and no one who has ever heard them would think of confounding them with any other kind of water bird to be found in Ontario. One does not need an ear for music to accomplish the distinction. Any one who can tell the bray of a donkey from the rooster's crow, should be able to distinguish the Caspian Tern by its notes, but the Herring Gull and the Ring-bill have long been a puzzle to me and I did not get any serious help from this visit, except that the Ring-bill did not give us any example of the cackle so often used by the Herring Gull, but the musical tones of the gulls we found indistinguishable, both of them using many different pitches and phrasings.

Considering that there was so little opportunity for concealment, the Ring-billed Gulls concealed their nests very well, placing them among the grasses which grew in the cracks between the rocks.

When the cracks were of sufficient dimensions, say five or ten inches, the concealment thereby afforded was substantial, and the Ring-billed Gulls placed their nests in these strips of grassy growth at from four or five feet to fifteen feet apart.

We found the Herring Gulls to be less companionable than the others as their nests were much farther apart, seldom being as close as fifteen feet from one another. They seemed also to have laid their eggs a little earlier as we found three or four of their nests with newly hatched young, while none of the Ring-bills or Caspian Terns had hatched a single egg. Three was the maximum set for each and two were apparently being incubated in a good many cases.

Against the 155 nests of the Caspian Tern we found only 64 nests of the Herring Gull, and 77 nests of the Ring-billed Gull, and Mr. Bottril and Mr. Brown think that the Caspians in the colony are increasing slowly.

Sometimes nesting grounds of this character are apt to be much molested by human beings, but in the present instance such is not the case.

During the nesting season, the Georgian Bay indulges in a good deal of windy weather. The approach to these islands is so bad that landing can only be managed on a day so calm that it would be exceptional. To make matters still better for the Gulls and Terns they nest in a season in which the fishermen are very busy, and there is no other class of inhabitants nearby.

One of our friends had heard that there were a few Caspian Terns nesting on an island some ten or twenty miles south where the Common Tern has a colony, but we were not able to investigate this rumor.

The migration route of this species was for a long time an unsolved puzzle. They appeared in small numbers at various points in the lower lakes and that was about all we knew of them, but from the observations of Mr. E. M. S. Dale of the McIlwraith Ornithological Club, and of our president, Mr. J. F. Calvert, it seems that after the breeding season has finished, these birds make a very leisurely

journey southward, following roughly the route of the Trent Valley canal, and from there they doubtless make longer flights to the south.

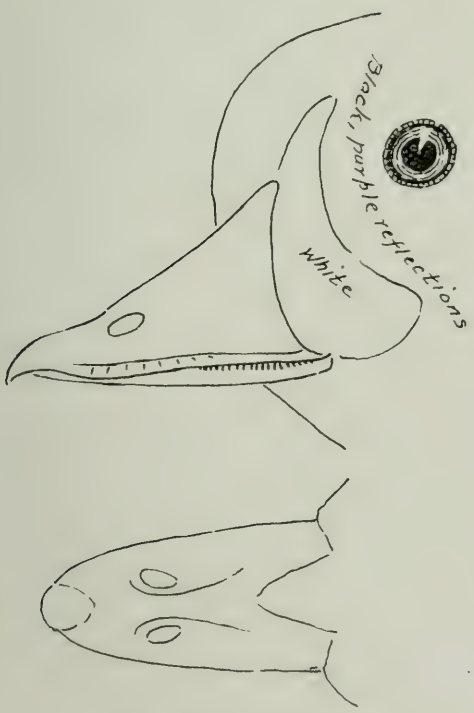
That their journeys are not confined to the immediate vicinity of water was proved by our president one day when he was gardening with his ears open, and heard from one of his friends of the Kawartha district, a salute from the upper air, making the only record we have of the occurrence of this Tern in Middlesex county.

AN IMPORTANT DISTINCTION BETWEEN OUR TWO GOLDENEYES.

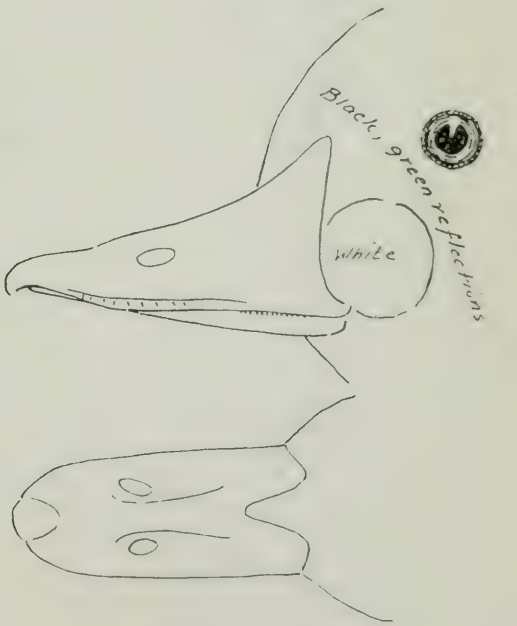
(Clangula clangula americana and *Clangula islandica.)*

BY P. A. TAVERNER.

Except in adult male plumage, the resemblance between the American Goldeneye and Barrow's Goldeneye is so close as to cause considerable confusion in identification. Adult males, the American with its round facial spot against the green-black head and Barrow's with a crescentic spot of purple black are distinctive and need never be confused.



BARROW'S GOLDENEYE.

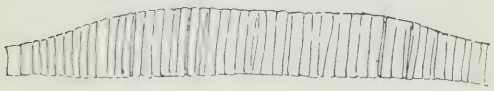


AMERICAN GOLDENEYE.

The females are so nearly alike as to be separable with difficulty. Various plumage analysis of the two species have been worked out but the one really satisfactory distinction seems to be in the size and shape of the bill which shows the only constant character for all plumages. Even in this feature the occurrence of poorly developed juveniles is a disturbing factor. Barrow's Goldeneye has a decidedly shorter, narrower and more stumpy bill than the American Goldeneye. The difference, however, is one that it is difficult to carry in mind and can only be certainly perceived when specimens are directly compared.

The male of the year is almost as difficult as the female to diagnose until traces of the adult head coloration begin to show, when the problem is immediately simplified. One distinction between these plumages has been pointed out by Major Allan Brooks and it seems reliable. A firm stroking with the finger from the base of the culmen over the crown reveals in Barrow's Goldeneye that the skull rises at the base of the bill more abruptly than in the American Goldeneye. The dissection of a number of specimens of both species, lately, however, has revealed another distinction that I cannot find hitherto recorded. The wind-

pipes of the males of the two species just before they enter the body at the merry-thought, are strikingly different. That of Barrow's Goldeneye is gradually enlarged and gradually reduced in diameter at this point. That of the American Goldeneye on the other hand is much more rapidly enlarged and then very suddenly reduced, forming a conspicuous bulbous enlargement between the arms of the clavacles. The illustrations herewith show this difference quite well. The sketches were made from dried specimens moderately stretched to show the details and are considerably longer than is normal in life. It will be noticed, also, that whilst the bony rings forming the pipe of the Barrow's Goldeneye are even and comparatively regular in shape, those of the American Goldeneye are much more irregular and confused in design.* I have purposely taken the trachea of a juvenile or yearling American Goldeneye in its first winter for comparison with the adult Barrow's Goldeneye, for between these two developments the least difference would be expected. Half-fledged American Goldeneyes which I have examined show little or none of this specialization, but it is notable that complete development is reached by or before mid-winter. This specific difference does not extend to the females at any age.



WINDPIPE OF BARROW'S GOLDENEYE.
Male, adult: Perce, Gaspe Co., Que., Feb., 1916.



WINDPIPE OF AMERICAN GOLDENEYE.
Male, jv: Barkley Sound, Vancouver Island, B.C., Jan. 1, 1916; No. 8916.

Besides offering a reliable specific test for young males this specialization of the windpipe is interesting as suggesting that Barrow's Goldeneye is the more ancient type of the two as it is obvious that the American Goldeneye's windpipe is a specialization of Barrow's Goldeneye and not *vice-versa*.

*Since writing the above I find that the difference between the windpipes of the two species is noted and figured by J. Bernard Gilpin; Proc. and Trans. N. S. Inst. Nat. Sci., IV, 1875-1878, 398-399. P.A.T.

THE MIGRATORY BIRDS CONVENTION.

BY HARRISON F. LEWIS, QUEBEC, QUE.

The Migratory Birds Convention is such a great advance in systematic protection of North American migratory birds, and it has already proved to be so beneficial, that one hesitates to offer any criticism of it. A short experience with the workings of the convention and its enabling Act, has, however, revealed not only its strong points, but also two or three matters, of greater or lesser importance, where improvement seems to be needed.

The birds protected by the Treaty are classified therein as "migratory game birds," "migratory insectivorous birds," and "migratory non-game birds." Further details of the species included in the terms of the Treaty are given under each of the above headings, but under no heading can one find any of the large, important, and beneficial family of the Fringillidæ, except grosbeaks, which are mentioned as such among the "migratory insectivorous birds." The writer, having reported to the Dominion Parks Branch of the Department of the Interior, which is charged with the work of carrying out in Canada the provisions of the Treaty, that Snow Buntings were being sold in considerable numbers by the grocers of Quebec, was courteously informed that, after investigation, "it would seem that the Snow Bunting is not protected under the Migratory Birds Convention Act." Presumably most, if not all, of our other Sparrows and Finches would be classified with the Snow Bunting, as they, too, are mainly graminivorous.

Surely this is a grave oversight, and one which should be remedied as soon as possible, by an amending Treaty, or such other action as may be necessary. Sparrows and Finches are highly migratory, while the usefulness to man of their food habits is well known. The following remarks in this regard are quoted from E. H. Forbush's "Useful Birds and their Protection."

"Dr. Judd, in his important paper, 'The Relation of Sparrows to Agriculture,' states that the value of

these birds to the agriculturist is greater 'than that of any other group whose economic status has thus far been investigated' . . . The great bulk of the food of Sparrows consists of seed, fruit, and insects. The native Sparrows destroy very little grain, great quantities of weed seeds and insects, and hardly any cultivated fruit; they are, therefore, almost entirely harmless. They frequent grass fields, cultivated fields, and gardens, and in some cases orchards; thus their good work is done where it is of great benefit to the farmer."

In addition to these facts, it may be noted that many of the Sparrows and Finches are excellent songsters, and a number of them are among our beautiful and brightly-colored native birds. The popular prejudice against "Sparrows" which has resulted from the harm wrought by the imported English Sparrow, or House Sparrow, should not be allowed to prevent proper protection to our useful, attractive native Sparrows. Such occurrences as the above-related sale of Snow Buntings for food show that these birds need protection, and it does not appear why it should be withheld from them while it is very properly granted to such economically neutral birds as guillemots and petrels.

Another feature of the convention which seems to be capable of improvement is the nomenclature, which one would expect to find unusually accurate and correct in such a Treaty. The "migratory game birds" are correctly designated by the scientific names of the families included, followed by the general English names commonly applied to the members of each family, as, for example, "Anatidæ or waterfowl, including brant, wild ducks, geese and swans." "Migratory insectivorous birds" is, however, stated to mean the following: "Bobolinks, catbirds, chickadees, cuckoos, flickers, flycatchers, grosbeaks, humming birds, kinglets, martins, meadowlarks, nighthawks or bull bats, nuthatches, orioles, robins, shrikes, swallows, swifts, tanagers, titmice, thrushes, vireos, warblers, waxwings, whippoorwills, woodpeckers and wrens, and all other perching birds which feed entirely or chiefly on insects." "Migratory non-game birds" is defined by a similar list of popular English names. The undesirable inexactness and repetition in such a list are too evident to require comment, while its only system appears to be the alphabetical one. The actual working of the Treaty is hindered by such inexactness, for if, in a given region, the popular name of a bird, which it is intended to protect, is not one of those included in the above list, the people of that region will have difficulty in understanding that the Treaty applies to that bird, and the local judicial authorities may even rule that it is not protected there. "Wild geese" are protected in Quebec by the provincial law, but Canada Geese are commonly known in that province as "Outardes," and the provincial authorities have decided that they are not protected in Quebec by the law protecting "wild geese," and that they will not be protected by that law until the term "Outardes" is added to the names of the birds so protected. It seems evident that too great care cannot be exercised in naming the birds to be granted protection by the Migratory Birds Convention, or any other similar document.

There are many things in favor of naming such protected birds species by species, giving in each case the scientific name, followed by all the known popular names used in the area of protection. Such a system of naming would give accuracy and easy popular recognition, which are both highly desirable. It might result in quite a long list, but is there any objection to that? Failing such a system, should not all the birds protected by the Migratory Birds Convention be accurately and systematically named by families, at least, as are the "migratory game birds?" It is to be hoped that the efforts of all those in Canada and the United States to whom birds are of value will be joined together to secure the amendments necessary to enable the convention to perform to the best advantage all the work which it ought to perform.

A RATTLESNAKE, MELANO GARTER SNAKES AND OTHER REPTILES FROM POINT PELEE, ONTARIO.*

BY CLYDE L. PATCH, OTTAWA, ONT.

Point Pelee, Essex County, Ont.—the most southern point in Canada—is about six miles wide at the base and, pointing southward, extends nine miles out into Lake Erie, ending in a sand bar. A shore line map of the point somewhat resembles an outline drawing of a funnel.

The human population is comprised of about a dozen families, fifty per cent of whom devote their time to agricultural pursuits, while the other half gain a livelihood by commercial fishing. This locality might prove of archæological interest, as Indian skeletons and pottery are from time to time uncovered by the plow or the sand-shifting winds.

Point Pelee's point and west shore are wooded, while the east shore is for miles a low-sloping sandy beach a hundred or more feet in width, crowned by a fringe of willows which separates it from several square miles of marsh. The east beach is an ideal resting ground for the Piping Plover, and a most inviting point of stop-over for migrating waders. The marsh, with its several open ponds, is a feeding ground for migrant waterfowl and on or near it many resident species nest—Black Duck, Teal, Florida Gallinule, Least Bittern, Black Tern, Long-billed Marsh Wren, etc. The waters of the marsh are inhabited by various species of fishes of which the Dogfish *(Amia)* is probably the most plentiful. An interesting sight is a swarm of black, young Dogfish in a spherical mass formation two feet in diameter, and beneath the parent lurking like a bull-dog on guard.

Owing to the geographical situation of Point Pelee, many plant and animal forms found nowhere else, or only sparingly, in other parts of Canada here thrive in profusion. A floral list would include such southern tree forms as the Chestnut, Tulip, Walnut, Paw paw, and the Mulberry, which grows to a height of twenty-five feet and bears delicious thimbleberry-like fruit. Among the lower growing forms can be listed the Spice-bush, the Wafer Ash and the Prickley Pear Cactus, which grows in beds sometimes ten feet in diameter and bears beautiful lemon-yellow flowers each of which lasts only for a day.

The fauna of Point Pelee equals the flora in interest, for here the Cardinal nests, and the Yellow-breasted Chat and the Mocking Bird are found, and the Turkey Buzzard, scavenger of the south lands is not infrequently seen soaring aloft.

Among the Red Cedars which cover about fifty per cent of the wooded land, the Damon Butterfly is sought by entomologists, and in the open places the Ajax Butterfly has been taken.

Baird's Mouse is common under the drift-wood on the beaches and until recently the Cotton-tail Rabbit was conspicuous on the evening landscape.

With life so rich and varied one might expect to find the class Reptilia well represented, and so it is.

In 1913, the writer spent the three summer months on Point Pelee as a member of a Biological field party from the Victoria Memorial Museum. During this period fifty-nine reptiles representing eight species were collected. The following list includes in addition three species not collected at this time:

1. BLUE-TAILED SKINK, *Plestiodon fasciatus.*

Common under the drift-wood on the beaches, where it deposits its eggs in the rotting wood. Among the nine specimens taken the old adult color phase (olive-brown body with coppery-red head) is represented by only one individual. The largest specimen measures six and seven-eighths inches in length.

2. HOG-NOSED SNAKE, *Heterodon contortrix.*

Common on the sandy-soiled, sparsely timbered areas. Among the six specimens taken, color phases varying from yellow with dark brown markings to almost black are represented. The largest individual measures thirty-two inches.

3. BLACK RACER SNAKE, *Coluber c. constrictor.*

This species is represented in the Museum herpetological collection by a skin taken on Point Pelee, in 1906, by Mr. P. A. Taverner. Judging by the skin, the specimen from which it was taken was about six feet in length.

4. FOX SNAKE, *Elaphe vulpina.*

Common on the beaches, where the eggs are deposited under the dead wood. Apparently several individuals sometimes place their eggs in the same site, as on one occasion three specimens and half a bushel of eggs were found under a section of log. On emission the eggs are coated with an adhesive fluid which causes them to adhere and form masses. The largest individual taken measures four feet nine inches.

5. GARTER SNAKE, *Thamnophis s. sirtalis.*

Of the serpents on Point Pelee this is the most

*Published by permission of the Geological Survey of Canada.

abundant species. It here shows a tendency to produce melanistic individuals. Three adult melano specimens were collected and a female which was transported to the museum gave birth to two black individuals in a litter of thirty-eight. With the exception of white lower jaws and throats the adult melanoes are coal black and might pass for Pilot Snakes *(Elaphe o. obsoleta)* or for Black Racer Snakes *(Coluber c. constrictor)* were it not for the divided anal plate of the former and the smooth scales of the latter species neither of which features are characteristic of *T. sirtalis.* The young individuals are black over all. The largest melano and normal specimens measure thirty and thirty-nine inches respectively.

6. RATTLESNAKE, *Crotalus horridus.*

The only example of this species in the Museum collection was taken near the end of Point Pelee on Sept. 29, 1918, by Capt. G. Wilkinson of the life saving station. In spite of the fact that for the past fourteen years the "Point," owing to its Carolinian fauna and to its being on one of the chief bird migration routes, has been the favorite observation and collecting ground of several of the Dominion's keenest naturalists, this is the only Rattler recorded in recent years.

The capture of a young individual might indicate that there were other members of the species there present, but as this specimen is an adult measuring fifty-six inches in length and six and one-fourth inches in girth, the probabilities are that the Rattlers at Point Pelee, like those of many other localities in southern Ontario, have been exterminated.

7. MUSH TURTLE, *Kinosternon odoratum.*

Two individuals of this species were discovered by members of our party who stepped on them while wading in the marsh. The carapace of the larger specimen measures four and one-half inches in straight length.

8. SNAPPING TURTLE, *Chelydra serpentina.*

Several examples of this species were observed but owing to the small size of our containers no specimens were preserved.

9. SPOTTED TURTLE, *Clemmys guttata.*

The carapace of the largest of the six specimens collected measures four and three-fourths inches in straight length.

10. BLANDING'S TURTLE, *Emys blandingii.*

Two small individuals of this species were collected.

11. PAINTED TURTLE, *Chrysemys m. marginata.*

This species and C. *guttata* are about equally represented in the marshes.

As the foregoing is probably not a complete list of the Reptilia of Point Pelee, additional records would be of interest.

NOTES AND OBSERVATIONS.

CANADA—HOW AN ALGONQUIN COUNTRY RECEIVED AN IROQUOIS NAME.—In the edition of Champlain's Voyages, 1604-1618, reproduced by the American Historical Society, the editor in a foot-note writes of Hochelaga: "This place was probably inhabited by Iroquois." A similar assumption is made by a writer in the last Ontario Archæologicai Report. In neither case is there evidence of any kind cited to support this contention and the idea seems to be merely deduced from the fact that when Cartier visited Hochelaga in 1535, he found there a flourishing settlement, while when Prevert, one of Champlain's lieutenants, reached the same locality in 1603, no trace of village or settlement remained.

Recently, however, I came across some evidence which seems to give this contention a more solid footing.

I have in my possession a copy of Zeisberger's Indian Dictionary. It is a presentation copy given to the date Mr. Lindsay Russell, by Prof. E. N. Horsford, of Harvard, at whose expense and under whose supervision the work was printed in Boston in 1887. The information contained in this book is taken from the manuscript of David Zeisberger, a Moravian missionary who worked amongst the Indians for sixty-eight years from 1740 to 1808. The manuscript is now in Harvard College.

This work is printed in four parallel columns, English, German, Onondaga and Delaware, the latter two representing the Iroquois and Algonquin linguistic stocks respectively.

On page 103 I find English and Onondaga as follows, viz:

English	*Onondaga*
To inhabit	Tienageri
Inhabitants in Canada	Tiochtiage hotinageri

and on page 185

English	*Onondaga*
At the fork of two streams	Tiochuhogu

Now as Hochelaga was situated at the confluence of the St. Lawrence and Ottawa rivers, and as "In Canada" doubtless meant to the Iroquois of that day "In the country north of the St. Lawrence," to one knowing the different forms which an Indian word may take, owing to the language never having been a written one, it seems a fair inference that Hochelaga and Tioch-

tiage were in intent the same word, and probably derived from Tiochuhogu.

The word Tiochtiage may have been to some extent local in its use, but it was evidently current with the Eastern Iroquois amongst whom Zeisberger labored, and they it was who occupied Hochelaga if any of the Iroquois did.

If we accept the foregoing as evidence that the people of Hochelaga were Iroquois, we can readily understand how Cartier obtained the name Canada there—it being an Iroquois word meaning "a settlement or village"—and so gave an Iroquois name to a country almost all of whose natives were Algonquin.

Furthermore, this does away with the assumption that the Iroquois were at any time to any extent settled along the lower St. Lawrence river or the Gulf, a state of affairs that is highly improbable owing to the lack of their place names in that region.

Champlain evidently took the name Canada from the tradition and history of Cartier's voyage, for on his map dated 1613, while he names the country as a whole "New France," he marks its most easterly section "Canadas," and in his journal he names the inhabitants of that section the Canadian Indians, although they, being probably Abenakis and so of Algonquin stock, would not know what the name meant. ARMON BURWASH.

AN ONTARIO BIRD SANCTUARY.—It is regrettable that the penetration of our wild lands by the settler and their development for agricultural purposes should involve the destruction of the haunts and breeding places of the creatures that contribute most to the beauty and charm of the countryside, and are the most assiduous protectors of the crops which are the primary cause of their disturbance. And yet it is one of the facts which bird lovers have to face. What can we do to counteract this unavoidable result of the extension of our country's most important industry? How can we help to check this retreat; how can we help to retain in our settled lands some of those sights that greet us under conditions so feelingly described by Duncan Campbell Scott:

"When you steal upon a land that man has not
sullied by his intrusion,
When the aboriginal shy dwellers in the broad
solitudes
Are asleep in their innumerable dens and night
haunts
Amid the dry ferns, with tender nests
Pressed into shape by the breasts of the mother
birds?"

An answer to these questions is given by Miss Edith L. Marsh in a welcome little book, "Birds of Peasemarsh."*

Of the several means by which we may check the disappearance of so many of our native birds in settled districts the creation of bird sanctuaries constitutes one of the most effectual. Such sanctuaries have been established by governments and organizations, but in Canada the maintenance of private bird sanctuaries has not as yet made very great progress. For this reason Miss Marsh's description of her work and the many species of birds that are taking advantage of her efforts on their behalf forms a most valuable contribution to our Canadian literature for the promotion of wild life conservation.

It is written in a most readable and popular style and the educational value of the book makes it especially welcome. It should be in the hands of all who wish to keep the birds around them, and who does not?

Where the Indian river flows into the Georgian Bay beneath the beautiful Blue Mountain there is a tract of land which from the earliest days has been a favorite haunt of many species of land and water birds. Fortunately, it is in the hands of those who are striving to retain as many as possible of the former feathered creatures of its upland, woods and marsh.

In order to secure as much protection as possible under the provincial laws the Ontario Government has been prevailed upon to create Peasemarsh Farm a bird sanctuary under the Ontario Game Act. In Ontario, therefore, we have two such private sanctuaries: the Miner sanctuary in Essex county and the Peasemarsh sanctuary in Grey county.

But the mere creation by law of a sanctuary does not ensure the attainment of its objects. The protection of birds involves not only the provision of natural and artificial haunts, feeding and nesting places, but also the suppression of predatory enemies, whether they be the possessor of a .22 rifle or the four-footed or winged enemy. These needs and the methods of meeting them are described.

We hope that Miss Marsh's book will be widely read and her example followed not only in Ontario but in all other provinces. Nothing would contribute more to the conservation of our native bird life than the establishment of similar sanctuaries throughout Canada. The Dominion and Provincial Governments are making excellent progress in the establishment of wild life reserves, but incalculable good would result from the creation by private individuals of sanctuaries similar to Peasemarsh. Bird lovers owe much to Miss Marsh for her praiseworthy effort, which has our best wishes for success.

C. GORDON HEWITT.

*Birds of Peasemarsh. By E. L. Marsh. Musson Book Co., Toronto.

THE CANADIAN FIELD-NATURALIST

VOL. XXXIII. OCTOBER, 1919. No. 4.

ARCHÆOLOGY AS AN AID TO ZOOLOGY.*

By W. J. Wintemberg.

INTRODUCTION.

The important bearing of palæontology on zoology has long been recognized by zoologists, but it is not so generally known that archæology also can give valuable aid to zoology. To the archæologist, however, the saving of the bones and shells of animals found in the course of his explorations of the graves, mounds, shell-heaps and village sites of prehistoric man, is important principally because it is by means of them that he learns something of the kinds of animals used for food, and what animal bones were used as material for artifacts, by prehistoric people. For a long time some archæologists did not seem to see any further use for such findings, but all now realize how important it is for them to collect all bones of animals, not only for their own purposes, but for the zoologist's also. So much of the earlier archæological exploration, too, was conducted in a prefunctory manner with a view more to secure rarities than anything else. To the mere relic seeker, especially, animal bones are useless rubbish, and it is surprising that even those from whom better work could have been expected seldom collected these bones unless they showed evidence of workmanship.

In nearly every prehistoric site explored by the archæologist animal bones and shells are more or less numerous, but they are found less frequently in graves and mounds. The Roebuck prehistoric village site, near Prescott, Ontario, explored by the writer for the Geological Survey, Canada, in 1912 and 1915, yielded a large number of shells of fresh-water clams and animal bones, of which about six barrels were collected. From the Baum village site, in Ross county, Ohio, twenty barrels full of bones were sent to the museum of the Ohio Archæological and Historical Society in Columbus. One can get an idea from this of the large accumulations of shells and bones sometimes found.

The bones of nearly all the larger animals used as food are found. The presence of the smaller birds and such animals as mice, shrews, moles, and bats, which were probably not used as food at all, is most often not due to human agency, especially when the entire skeletons are present. Mere absence of the bones of a certain animal from shell or refuse heaps, however, does not necessarily mean that its flesh was excluded from the aboriginal menu. Its bones may have been so small as to disappear, or they may have been gnawed to pieces by the aboriginal dog. Some taboo prohibiting the eating of the flesh of certain species may account for the absence of the bones of other animals.

Some of the bones may owe their preservation to the fact that they were buried in refuse heaps composed mainly of wood ashes. Another factor which probably accounts for the excellent preservation of some is that most of them had been boiled with the meat on them, thus possibly eliminating nearly all the animal matter which might cause decay. A few owe their preservation to partial carbonization. The shells of fresh-water clams found in the refuse in some places are invariably fresh looking with the epidermis intact and the inside surface still retaining its pearly lustre.

One has to contend with several difficulties in determining the species of animals to which many of these bones belonged. Many of them have been reduced to indeterminate fragments, possibly in order to extract the marrow and also to make them of a size small enough to go into cooking pots. Others have been fashioned into various implements and ornaments; although as in the case of awls, enough of the original shape of the bone sometimes remains to enable one to identify the species of animal to which it belonged.

As to the probable age of the sites where these bones are found, it will perhaps be unnecessary to say that where no relics of the white man occur, they may be all the way from three hundred to five hundred and perhaps more years old. Algonkian sites in Ontario, and probably in central New York

*Besides those whose help is acknowledged in the text, grateful acknowledgments are here tendered to all others who kindly supplied me with information.

also, may antedate the Iroquoian occupation by hundreds of years, but these do not yield many animal remains.

By identifying the animal bones collected by the archæologist the zoologist can determine the former presence of (1) animals now extinct, of which we have no historical record; (2) animals which are known to have become extinct or to have been exterminated since the arrival of Europeans on this continent; (3) animals not now living in the vicinity of the prehistoric site, but found in other and more distant parts of the country; and (4) animals still living in the area covered by the archæological explorations. It is also possible for him to greatly extend the range of some species thus filling in gaps in distribution.

As practically all the bones owe their presence in archæological sites to the fact that they are those of food animals it would probably be possible to get an approximate idea of the relative abundance of any of these animals in a certain region. The bones of those most relished for food would naturally preponderate and there would be a preponderance of the herbivores as compared with carnivores.

Given a sufficient number of specimens it is possible for the zoologist to learn whether there is any difference in the size of the bones or shells of recent and prehistoric animals of the same species. For example, there is a difference in size between recent oyster shells and those from shell-heaps. Oyster shells found by Mr. Harlan I Smith in a shell-heap on Merigomish harbor, Nova Scotia, are much larger than those of oysters now living in the vicinity. Those from the heaps of Damariscotta, Maine, likewise are much larger than recent shells, being from eight to ten and some even fourteen inches long. Then, too, Dr. Edward S. Morse has found that shells of *Mya* from prehistoric shell-heaps of the coast of Maine and Massachusetts were higher in comparison with their length than recent specimens collected in the immediate vicinity of the same heaps. He also observed a change in the shell of the common beach cockle *(Lunatia)*. The ancient shell-heap form from Marblehead, Mass., "has a much more elevated spire than the recent form living on the shore today, and this variation curiously enough was in accordance with what he had observed in a species of *Natica* in the Japanese shell-heaps."[1]

There is a possibility, too, that the zoologist might discover among archæological finds some bones exhibiting unknown pathological conditions of interest to the student of animal pathology. It is of interest to note here that the shells of *Unio complanatus* Solander, one of our common fresh-water clams, found in the refuse of the Roebuck village site, seemed to be affected by the same species of parasitic fresh-water sponge (probably *Vioa)*, causing exfoliation of the sides and umbonic region, as are those of the present day.

ZOOLOGICAL INTEREST OF SOME ARCHAEOLOGICAL DISCOVERIES.

The mention of a few examples will suffice to show that some other discoveries made by archæologists are of considerable zoological interest. One of the most recent was made by the late Dr. H. Haeberlin, of Columbia University, New York, in a cave in Porto Rico.[2] The bones were those of a large extinct species of rodent belonging to a new genus and species, allied to *Plagiodontia*. To this rodent Dr. J. A. Allen has given the name *Isolobodon portoricensis*.[3]

In shell-heaps in Maine were discovered many bones of an extinct species of large and heavily built mink *(Lutreola macrodon* Prentiss), which "may have lived to historic times." Fifty-three finds of this mink were made in one shell-heap alone, one-fifth of all the animal bones found.[4]

Dr. Henry C. Mercer in his explorations of the Durham cave in Bucks county, Pennsylvania, found two vertebræ and a fragment of the lower jaw of an extinct species of peccary *(Mylohyus pennsylvanicus)*. The modern peccaries are not known to have ranged any farther north than the Red river.[5]

As examples of discoveries which have extended the range of certain species, I might mention the following: In a mound in Lee county, Virginia, were found the bones of the caribou, which, on the authority of Dr. J. A. Allen, "is farther south than bones of the caribou have hitherto been found."[6] In a shell-heap in Maine, Dr. Wyman found the bones of the elk or wapiti. This animal

[1]Changes in Mya and Lunatia since the Deposition of the New England Shell-heaps, Proc. Am. Assoc. Adv. Science, 30th meeting, Cincinnati (Salem, 1882), p. 345.

[2]Some Archaeological Work in Porto Rico, American Anthropologist, N.S., 1917, Vol. 19, pp. 225-226.

[3]An Extinct Octodont from the Island of Porto Rico, West Indies, Annals of the New York Academy of Sciences, Vol. XXVII, pp. 17-22.

[4]Loomis, F. B., and Young, D. B., On the Shell-heaps of Maine, The American Journal of Science (New Haven, Conn.), 1912, Vol. XXXIV, pp. 27-28. See also F. B. Loomis, New Mink from the Shell-heaps of Maine, ibid., 1911, Vol. XXXI, pp. 227-229; D. W. Prentiss, Description of an Extinct Mink from the Shell-heaps of the Maine Coast, Proceedings of the U. S. National Museum (Washington, 1903), Vol. XXVI, pp. 887-888, and an article by M. Hardy on The Extinct Mink from the Shell-heaps, Forest and Stream, 1903, Vol. LXI, p. 125. Hardy thinks the animal became extinct about 1860.

[5]An exploration of Durham cave in 1893, Publications of the University of Pennsylvania, Vol. VI, p. 175.

[6]Carr, Lucien, Report of the Exploration of a Mound in Lee county, Virginia, etc., Report of the Peabody Museum, Vol. II, 1876-78, p. 80.

then (1868) was not known to exist east of the Alleghany mountains.[7]

The discovery of bison bones in a cave on the upper Tularosa river, New Mexico, has extended the southwestern range of this mammal over one hundred miles.[8]

One of the most recent discoveries is that of some deer bones in Nova Scotia. Mr. Smith found a distal phalanx and some teeth in shell-heaps on Merigomish harbor, and I found several astragali, distal[9] and proximal phalanges, the distal end of a humerus and teeth in a shell-heap on Mahone bay, about seventy-five miles west of Halifax. Nicholas Denys[10] *(circa* 1653) does not mention the deer, and the first printed record of its appearance in Nova Scotia was in 1888. Even in New Brunswick it was not seen until 1818, only becoming plentiful by 1847.[11]

Although they were plentiful in the days of early settlement, caribou seem to have been scarce around Mahone bay in prehistoric times, only a small piece of antler, doubtfully referred to this species, being found in the shell-heap there. Only a few individuals, also, are represented among the animal remains from Merigomish harbor.

Some archæological discoveries may help to settle uncertain or disputed points in zoology. For instance, I found in the prehistoric shell-heap on Mahone bay, the shells of the land snail *Helix hortensis* Müller,[12] and Dr. G. F. Matthew found some in a shell-heap at Bocabec, New Brunswick.[13] They have also been found on an island in Penobscot bay, Maine,[14] and on Martha's Vineyard.[15] This snail is considered to be "unquestionably identical with the European species," and it was for a long time generally accepted by conchologists that it had been introduced from Europe. Morse, however, considered it "strange that, while in the old country it is found near the habitations of men, in this country it occurs only upon the most uninhabitable islands."[16] The shells found in the Mahone bay shell-heap, while they still retain traces of the rarely occurring rufous revolving bands, bear the same appearance of age as the other shells composing the heap. There is a possibility that these snails worked their way down into the shell-heap recently, perhaps by way of the burrows of small mammals, but if this were really so we would expect them to be almost as fresh looking as recent shells. Besides, if these snails crawled into the heap recently, why did we not find other species also? Dr. Matthew found the shells of no less than six native species of snails at various levels in the heap at Bocabec, and Morse reported nine from a heap on an island on the coast of Maine.[17] It seems to me, therefore, just as probable that the snail shells from the Mahone bay shell-heap were deposited with the rest of the shells when the heap was formed as that they were intrusive. This and other testimony would tend to prove that the species was indigenous or else had found its way to America through other channels than commercial intercourse long before the arrival of Europeans on this continent.[18] Possibly they came by way of the much discussed land-connection between the old and the new world.[19]

The occurrence in a shell-heap on an island in Casco bay, Maine, "of the little snail *Zua lubricoides*" Stimpson (now known as *Cochlicopa lubrica* Müller), is also, according to Morse, "inconsistent with the view that it is an introduced species."[20]

It is still doubtful whether *Litorina litorea* (Linn.), or "Periwinkle," is an indigenous species or one introduced from Europe. No shells have yet been found in any of the prehistoric shell-heaps of the Atlantic coast, but if some were found deep in one of these heaps it would certainly be indisputable evidence that this species was here long before the advent of the white man. The possibility of finding this shell again suggests the necessity for careful and thorough methods of archæological

[7]Wyman, Dr: Jeffries, An Account of Some Kjoekkenmoeddings, or Shell-heaps, in Maine and Massachusetts, The American Naturalist, 1868, Vol. I, p. 572.

[8]Lyon, Marcus W., jr., Mammal Remains from Two Prehistoric Village Sites in New Mexico, Proceedings of the U. S. National Museum, 1907, Vol. XXXI, pp. 647-648.

[9]Identification confirmed by Dr. Gerrit S. Miller, of the U.S. National Museum.

[10]Description and Natural History of the Coasts of North America (Acadia), translated and edited by W. F. Ganong. Published by the Champlain Society (Toronto, 1908).

[11]Chamberlain, Montagu, Mammals of New Brunswick, Bulletin Natural History Society of New Brunswick (St. John, 1884), No. III, p. 39.

[12]Identification confirmed by C. W. Johnson, Curator, Boston Society of Natural History.

[13]Discoveries at a Village of the Stone Age at Bocabec, N.B., Bulletin Nat. Hist. Soc., New Brunswick, No. III, p. 24.

[14]Johnson, C. W., Helix hortensis from a Maine Shell-heap, The Nautilus, 1914-1915, Vol. XXVIII, p. 131.

[15]Johnson, C. W., The Distribution of Helix hortensis Muller, in North America, ibid., 1906, Vol. XX, p. 76.

[16]The Land Snails of New England, The American Naturalist, 1868, Vol. I, p. 187.

[17]Wyman, op. cit., p. 566. Also Proceedings of the Boston Society of Natural History, 1866-1868, Vol. XI, pp. 301-302. The presence in the lower portion of this particular heap of so many species of snails which, as Morse notes, can only exist in hardwood growths, whereas the island at the time of the exploration of the shell-heap was covered with large spruce trees, would argue a considerable antiquity for the shell-heap.

[18]See Johnson, op. cit., pp. 73-80. See also Dr. W. H. Dall's Land and Fresh-water Mollusks (Harriman Alaska Expedition, New York, 1905), Vol. XIII, p. 20, for its occurrence in the glacial Pleistocene of Maine.

[19]See Scharff, R. F., Distribution and Origin of Life in America (New York, 1912), p. 14.

[20]Wyman, op. cit., p. 566.

exploration. It might be of interest to note, in this connection, that shells of *Litorina irrorata* Say, which species now ranges no farther north than the coast of Florida, were found in the refuse of a prehistoric rockshelter near New Haven, Connecticut.[21] Its place in Connecticut waters is now taken by *Litorina litorea*.

While we are on the subject, I might mention a few other archæological discoveries of interest to the conchologist. The Mahone bay shell-heap, besides shells of *Mya arenaria* Linn., *Pecten Magellanicus* (Gamelin), *Venus mercenaria* Linn., *Spisula solidissima* (Dillwyn), *Spisula polynyma* (?) (Stimpson), *Mytilus edulis* Linn., *Ensis directus* (Conrad), *Lunatia heros* (Say), *Purpura lapillus* (Linn.), and *Buccinum undatum* Linn., also yielded two small shells of the oyster (*Ostrea virginica* Gmelin.) So far as I can learn very few oysters now occur in the bay. No oyster shells were found in the prehistoric shell-heap near French Village at the head of St. Margaret's bay.[22] Only a single fragment was discovered in a shell-heap on Cole harbor, east of Halifax.[23] Dr. Matthew did not find any oyster shells in the heap at Bocabec,[24] nor were they reported by Professor Baird from the heaps at Oak bay, St. Croix river.[25] Oysters seem very scarce on the Atlantic coast of Nova Scotia, and according to Whiteaves only a few are found at Jeddore Head, and in Country and Lipscombe harbors, east of Halifax. The same authority does not mention their occurrence anywhere on the Bay of Fundy.[26]

Our shell-heap evidence therefore is interesting as suggesting that the oyster also was scarce on the whole outer or Atlantic coast of the Maritime Provinces in prehistoric times. Mr. Smith found many oyster shells in the heaps on Merigomish harbor, which accords well with the present more common occurrence of the species in Northumberland straits.

On the coast of Maine there is a scarcity of oysters at the present day, but the prehistoric shell-heaps are almost entirely composed of oyster shells, some of the heaps, especially those on the Damariscotta river, reaching a depth of from six to twenty-five feet and covering many acres of ground.

21MacCurdy, G. G.: The Passing of a Connecticut Rockshelter, The American Journal of Science, 1914, Vol. XXXVIII, pp. 517-518.

22Jones, J. M., in Smithsonian Report, 1863, p. 371, and G[ossip], W., On the Occurrence of the Kjockkenmoedding on the Shores of Nova Scotia, Proceedings and Transactions of the Nova Scotian Institute of Natural Science for 1863-1866 (Halifax, 1867), Vol. I.

23G[ossip], op. cit., p. 98.

24Op. cit.

25Baird, Spencer F., Notes on Certain Aboriginal Shell Mounds of the Coast of New Brunswick and of New England, Proceedings of the U.S. National Museum, 1881, Vol. IV, p. 293.

26Catalogue of the Marine Vertebrata of Eastern Canada (Geological Survey, Canada), Ottawa, 1901, p. 115.

THE PREHISTORIC FAUNA OF THE ST. LAWRENCE AND OTTAWA VALLEYS.

One can get a fairly good knowledge of the fauna of the St. Lawrence and Ottawa valleys in prehistoric times from a study of the animal bones recovered from the Roebuck village site. This is the largest collection of animal bones from a single site in any museum in Canada. The bones comprise those of mammals, birds, reptiles and fish, and there also are shells of several species of land snails and fresh-water shell-fish. My information is as yet not complete enough to reconstruct the entire fauna, so I will attempt to show how the mammalian fauna alone could be reconstructed by means of archæological and other evidences.

The first column in the table below indicates the animals which are known to inhabit the country surrounding the Roebuck village site. The second column shows those whose former presence is vouched for by old residents.[27] In the third column is indicated the species formerly and still living elsewhere in the Ottawa valley within from fifty to seventy-five miles of the site. The last column gives the species represented by bones found at the Roebuck village site.

Names of Mammals	Present known Fauna.	Former known Fauna.	Elsewhere in Ottawa valley	Prehistoric Roebuck village site.
COTTON-TAIL RABBIT, *Sylvilagus floridanus* (Allen)	X			
VARYING HARE, *Lepus americanus* Erxleben[28]			X	X
CANADA PORCUPINE, *Erethizon dorsatum* (Linn.)		X	X	X
JUMPING MOUSE, *Zapus hudsonius* (Zimmerman)	X		X	
RED-BACKED MOUSE, *Evotomys gapperi* (Vigors)			X	

27I am indebted to Mr. George A. Drummond, of Roebuck, Ont., and Mr. F. P. Smith, of Brockville, for lists of mammals found in the vicinity of the site.

28It is interesting to note that neither Mr. Drummond nor Mr. Smith mentions the White or Southern Varying Hare. It has been known for some time that the common Cotton-tail rabbit is continually pushing its way farther to the north, gradually displacing the hare. The hare goes with the destruction of the coniferous forests and the Cotton-tail comes in with the second-growth. (See The Geographical Distribution of the Eastern Races of the Cotton-tail, etc., by Outram Bangs, in Proc. Boston Society of Natural History, 1895, Vol. XXVI, p. 413).

Names of Mammals	Present known fauna.	Former known fauna.	Elsewhere in Ottawa valley.	Prehistoric Roebuck village site.
MEADOW MOUSE, *Microtus pennsylvanicus* (Ord)[29]			X	X
MUSKRAT, *Ondatra zibethica* (Linn.)	X		X	X
WHITE-FOOTED MOUSE, *Peromyscus leucopus* (Rafinesque)	X		X	
CANADIAN BEAVER, *Castor canadensis* Kuhl.		X	X	X
WOODCHUCK, *Marmota monax* (Linn.)	X		X	X
CHIPMUNK, *Tamias striatus* (Linn.)	X		X	X
BLACK OR GRAY SQUIRREL, *Sciurus carolinensis* Gmelin	X			
RED SQUIRREL, *Sciurus hudsonicus* (Erxleben)	X		X	X
FLYING SQUIRREL, *Glaucomys volans* (Linn.)	X		X	
SHORT-TAILED SHREW, *Blarina brevicauda* (Say)			X	
BREWER'S MOLE, *Parascalops breweri* (Bachman)			X	
STAR-NOSED MOLE, *Condylura cristata* (Linn.)	X		X	
BROWN BAT, *Eptesicus fuscus* (Beauvois)	X		X	
SAY'S BAT, *Myotis subulatus* (Say)			X	
SILVER-HAIRED BAT, *Lasionycteris noctivagans* (LeConte)			X	
VIRGINIA DEER, *Odocoileus americanus* (Erxleben)	X		X	X
WAPITI, *Cervus canadensis* (Erxleben)[30]		X		X

[29]The incisor teeth of this species, identified by Dr. R. M. Anderson, of the Biological Division, Geological Survey, Canada, were recovered from the faeces of some animal, probably the aboriginal dog.

[30]Represented by a few molar teeth, a polished perforated canine, and possibly by some phalanges. Antlers were plowed up about one mile west of the site some years ago.

Names of Mammals	Present known fauna.	Former known fauna.	Elsewhere in Ottawa valley.	Prehistoric Roebuck village site.
MOOSE, *Alces americanus* Jardine[31]		X		X
WOODLAND CARIBOU, *Rangifer caribou* (Gmelin)[32]		X	X	
RACCOON, *Procyon lotor* (Linn.)				
BLACK BEAR, *Ursus americanus* Pallas	X			X
OTTER, *Lutra canadensis* (Schreber)		X	X	X
COMMON SKUNK, *Mephitis mephitis* (Schreber)[33]	X		X	
WOLVERINE, *Gulo luscus* (Linn.)[34]				
PINE MARTEN, *Martes americana* (Turton)				X
FISHER, *Martes pennanti* (Erxleben)		X		X
MINK, *Mustela vison* Schreber	X			X
NEW YORK WEASEL, *Mustela noveboracensis* (Emmons)				
SMALL BROWN WEASEL, *Mustela cicognanii* Bonaparte	X		X	
RED FOX, *Vulpes fulva* (Desmarest)	X		X	
GRAY WOLF, *Canis lycaon* Schreber		X		X
WILD CAT, *Lynx ruffus* (Gueldenstaedt)		X		
CANADA LYNX, *Lynx canadensis* Kerr	X		X	

[31]Represented by a few molar teeth and possibly an astragalus and several phalanges. The wide antlers are said to have been plowed up in the neighborhood of the site. Moose were killed by Gallinée and his party in Lake St. Francis, about sixty miles east of the site, in 1669.

[32]Mr. Drummond was informed by an old hunter that when a boy his father would bring in deer with the horns standing "straight up from the top of the head." The description at once suggests caribou. A caribou killed at L'Orignal about 1859 is the nearest record of its occurrence in the Ottawa valley.

[33]Although the skunk was eaten by some Indians and bones have been found on sites elsewhere, no bones were found at the Roebuck site.

[34]The wolverine may have ranged as far south as the St. Lawrence valley, but no bones were found at the Roebuck site. Dr. W. Brodie found some bones in refuse heaps in York county, Ont., which he thought were possibly those of this animal. (See Annual Archaeological Report of the Provincial Museum, Toronto, for 1901, p. 51).

Out of the thirty-eight species of mammals which possibly once constituted the mammalian fauna of the country in the neighborhood of the Roebuck site, we now know definitely that eighteen species were represented in prehistoric times. Six out of seven of the species and one doubtful species would be known only from archæological or historical evidences.

It will at once be apparent how important our archæological evidence would be if we had no historical evidence of the existence of these mammals, and especially after the lapse of another fifty or a hundred years, when many, if not most of the species, still found in the neighborhood, will have disappeared.

PREHISTORIC RANGE OF THE WILD TURKEY.

I will now endeavor to show by means of certain examples how archaeological evidence can be utilized to show the prehistoric distribution of certain species of animals. I have selected the wild turkey because it seems to have been one of the most important food birds wherever it was abundant. In two Ohio sites, explored by Mr. W. C. Mills,[35] for example, turkey bones constituted as much as eighty per cent of all the bird bones found. Almost everywhere, too, where the bird existed, the bones have been made into various implements and ornaments, the tarsometatarsus being the favorite bone for awls or bodkins. I have admitted such artifacts as evidence of its presence, although there is a slight danger here that when such artifacts are few in number they may have been brought from elsewhere.

Of the original turkey, the *Meleagris gallopavo* of Linnæus, there are now four recognized varieties, as follows:—

Meleagris gallopavo silvestris Viellot. Wild Turkey.

Range—Eastern United States from Nebraska, Kansas, Western Oklahoma, and eastern Texas, east to central Pennslyvania; formerly north to South Dakota, southern Ontario and southern Maine.

Meleagris gallopavo merriami Nelson. Merriam's Turkey.

Range.—Transition and Upper Sonoran zones in the mountains of southern Colorado, New Mexico, Arizona, western Texas, northern Sonora, and Chihuahua.

Meleagris gallopavo osceola Scott. Florida Turkey.

Range.—Southern Florida.

Meleagris gallopavo intermedia Sennett. Rio Grande Turkey.

Range.—Middle northern Texas south to northeastern Coahuila, Uuevo Leon and Tamaulipas.[36]

Third ed., Revised (New York, 1910), pp. 145-146.

As may be seen from the map these varieties are found distributed over a considerable area in North America.

In Canada its habitat was limited to the southwestern part of Ontario, and it was fairly abundant in the days of pioneer settlement. Mr. C. W. Nash, Biologist of the Provincial Museum, Toronto, in a letter to the writer states that so far as he has been able to discover the range of the Wild Turkey "was confined to that part of the province south of a line drawn from the corner of Lambton county to Hamilton. It may have occasionally wandered a little north of that in some places, but not far. East of the county of Wentworth I have never heard of it." According to Macoun's Catalogue of Canadian Birds, the late Dr. Brodie said, "that many years ago (between 1840 and 1850), a well-known and reliable hunter saw a flock on the west side of Yonge street, in the township of Whitchurch, near Toronto, Ontario."[37] Archæological evidence, seemingly confirmatory of the prehistoric presence of the bird in this very township, has been discovered by Dr. Brodie,[38] so it is altogether probable that the turkeys seen by Dr. Brodie's hunter informant were not stragglers but permanent residents of that part of York county.

It would be interesting to know just where and when the wild turkey first entered Canada, but, of course, this would necessarily be pure guess work. We know from archæological evidence, however, that the bird was in Ontario and probably fairly abundant three, four, or perhaps even five centuries ago. Perhaps then, as when the bird was first seen by whites, adverse climatic conditions prevented the migration of the bird farther north and east. This is singular when we consider that the domesticated turkey, although mostly housed during part of our severe northern winters, seems to thrive far north of the limits reached by its wild congener.

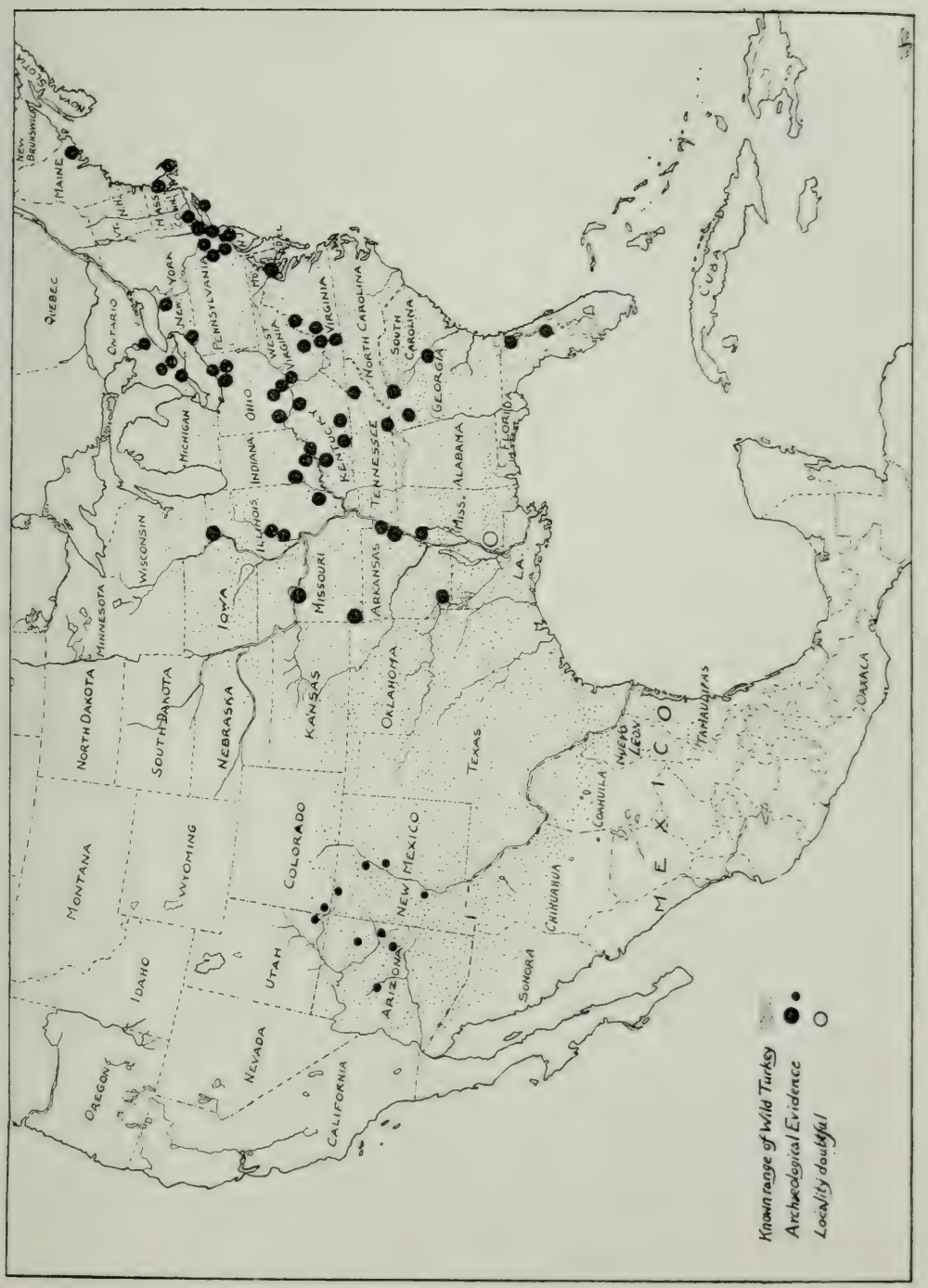
In Wisconsin the wild turkey is known to have ranged as far north as Green bay, but in all this region its bones do not appear to have been found. Perhaps the bird had spread there only a short time before the arrival of the whites. Carver *(circa* 1766-1768) saw "great plenty" of them near Lake

[35]"Explorations of the Gartner Mound and Village Site," (Reprint from the Ohio Archaeological and Historical Quarterly, Vol. XIII, No. 2); (Columbus, 1904), p. 32; and "Explorations of the Baum Village Site (Reprint, Ibid., Vol. XV, No. 1), 1906, p. 31.

[36]A. O. U. Checklist of North American Birds,

[37]Macoun, John and James M., Catalogue of Canadian Birds (Department of Mines, Geological Survey Branch, Ottawa, 1909), p. 234.

[38]Brodie, Dr. William, Animal Remains Found on Indian Village Sites, Annual Archaeological Report, 1901 (Ontario), p. 48



The known range of the wild turkey and the prehistoric range as far as determined from available archaeological evidence.

Pepin, in Minnesota,[39] and if they were seen as early as this they may have been common enough even a century earlier. The bird was once fairly plentiful in South Dakota. The Mandans knew the turkey, but no archæological remains of the bird have so far been found on prehistoric Mandan sites.

Now, turning again to the map, it will be observed that the farthest western archæological occurrence of what was probably *M. g. silvestris* is in southwestern Missouri,[40] the farthest southern in middle Florida and the farthest northern, in central Ontario. The occurrences in New Mexico and Arizona are most probably those of semi-domesticated *M. g. merriami;* at least the dessicated bodies with well preserved feathers, found in some ruins there, have been identified as Merriam's turkey. Our knowledge of the prehistoric range of the wild turkey, however, although slightly extended in one direction, is probably very incomplete. This is due to several reasons, one being that some regions may not have been inhabited by the turkey, the faunal areas occupied by Merriam's turkey and the Rio Grande turkey, for instance, being separated by a broad belt of desert country where the bird could not possibly exist. Then, again, other regions, *inhabited* by the turkey, were perhaps unsuitable for human inhabitants, and, in some areas, where there were human inhabitants, the bones of the birds for some reason may not have found their way to refuse heaps and mounds, or other archæological remains. Another cause, and I think this is probably the principal one, is that in some regions archæological work, if done at all, has not been done thoroughly; in short, it was not considered worth while to collect animal bones. In many instances also the identity of the bones, which may have been collected, has never been determined, and the complete results of the exploration are therefore not known.

What interesting results could be obtained had we the necessary data! Notwithstanding the incompleteness of our map, it may yet be interesting to ornithologists as showing where the turkey did exist in prehistoric times.

The very incompleteness of the map will, nevertheless, serve to emphasize how important it is for all future archæological work to be done in a thorough, systematic manner.

PREHISTORIC RANGE OF THE GREAT AUK.

Archæological finds of bones of the Great Auk *(Plautus impennis* (Linn.)), whose range on the European side of the Atlantic was from Iceland to the Bay of Biscay and on the American side from Greenland to Virginia, have helped to extend our knowledge of the former range of this bird considerably. This was interestingly shown in a map by Lucas in 1889.[41] Further evidence has been discovered since this map appeared and I take the liberty of presenting one here on a larger scale giving the location of these recent additions to our knowledge. The known summer and winter ranges are as indicated on the Lucas map, but to indicate the archæological evidence I am using a symbol which stands out more distinctly than that used by him.

In Europe the Great Auk was rarely met along the coasts of Norway and Sweden, but as is evidenced by the finding of its bones in shell-heaps, it frequented the fjords of Denmark in prehistoric times. Its remains have also been found in shell-heaps in the Orkneys, in Caithness, and on Oronsay island (Argyleshire), Scotland; in old sea caves in Durham, England, and in Donegal, Antrim, Waterford and Clare, Ireland.[42]

In America the remains of this bird have been found in shell-heaps along the North Atlantic coast. No evidence has been found of its presence in Nova Scotia, unless some bones found in the shell-heap at the head of St. Margaret's bay, and described as "evidently belonging to a bird much larger than the Great Northern Diver *(Colymbus glacialis)*[43] were those of the Auk. Baird found Great Auk bones in the shell-heaps of New Brunswick.[44] In Maine the bones occurred in sufficient numbers to justify the belief that the bird was formerly very common. It was represented among the animal remains found by Wyman in the shell-heaps at Mount Desert and Crouchs cove,[45] and the shell-heaps explored by Baird, especially those on some islands in Casco bay.[46] More recently, Loomis and Young found its bones the most abundant of the bird remains in one of the shell-heaps on Flagg island, Maine.[47] In Massachusetts its remains occurred in considerable numbers at Eagle Hill, in Ipswich.[48] Wyman found its bones in a

[39]Travels through the Interior Parts of North America, etc; Third edition, (London, 1781), p. 56.

[40]C. N. Gould in his "Prehistoric Mounds in Cowley county," (Kansas), speaks of finding the bones of a gallinaceous bird, which may have been those of the turkey. (Transactions of the Kansas Academy of Science, 1895-1896 (Topeka, 1898), Vol. XV, p. 80).

[41]Lucas, Frederick A.: Animals Recently Extinct or Threatened with Extermination ,etc., Report of the U.S. National Museum, 1889, p. 639.

[42]Sharpe, R. B., A Hand-book of the Birds of Great Britain (London, 1897), Vol IV, pp. 112-113; Saunders, H., An Illustrated Manual of British Birds (London, 1899), p. 698; and Hartert, E., Jourdain, F. C. R., Ticehurst, N. F., and Witherby, H. F., A Hand-list of British Birds, etc. (London, 1912), p. 206.

[43]Jones, J. M., in Smithsonian Report for 1863, p. 371.

[44]Op. cit., p. 297.

[45]Wyman, op. cit., p. 574.

[46]Op. cit., p. 296.

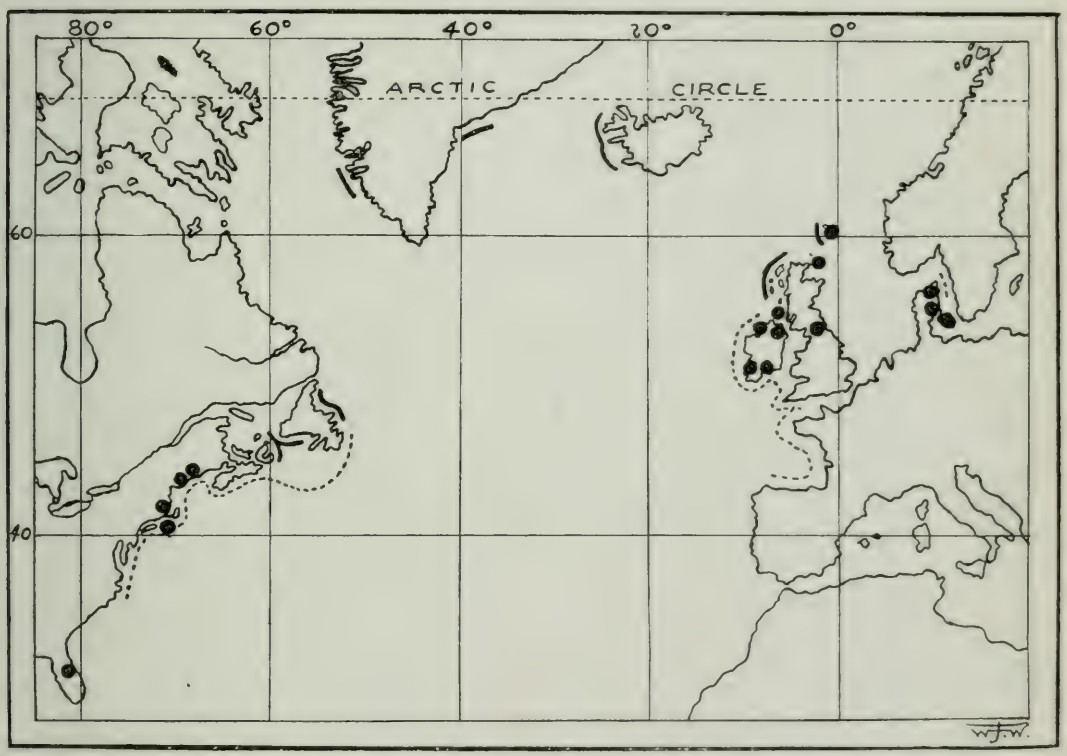
[47]Op. cit., p. 29.

[48]Baird, op. cit., p. 297.

shell-heap on Cape Cod,[49] and, according to Putnam, bones were also taken from the shell-heaps of Marblehead and Plumb island.[50]

Shell-heaps on Block island, off the coast of Rhode Island, likewise yielded evidence of its presence.[51]

The most interesting discovery yet recorded, however, is that of two left humeri of this bird in a shell-heap at Ormond, Florida, in 1902, by W. S. Blatchley and C. H. Hitchcock, which indicates that this bird must have gone farther south than has been generally supposed, but it is very doubtful whether it was a permanent resident of Florida.[52]



Summer Habitat of Great Auk ——. Winter Range -----. Archæological Evidence

The discovery of the bones of the Great Auk in shell-heaps has given rise to the question whether or not the bird was a summer resident of the New England coast. This has been discussed by Lucas, Miss Hardy and others. Lucas takes the ground that the bones are probably those of birds taken during their migration southward.[53] Miss Hardy, on the other hand, maintains that the bones are those of summer residents and not migrants,[54] because she thinks she "can show the best of reasons for believing that nineteen-twentieths of all the clams and oysters represented by one shell-heap were taken and shelled during the summer months." Dr. Eaton, however, speaking of the Block Island shell-heaps, says, "there is no reason for supposing that they were deposited during the summer only, or even principally. On the contrary, the remains of many birds which visit our coast in the autumn and early spring rather indicate a permanent residence of the Indians there. Furthermore, the fact that all the auk bones found belonged to mature skeletons is opposed to the theory that these birds bred on the island."[55] Forbush, considering the archæological and historical evidence, seems in the main to agree with Miss Hardy's conclusion and thinks "we have the best of evidence that the Great Auk was found in summer at the head of Buzzard

[49]Second Annual Report of the Peabody Museum (Boston, 1869), p. 17.

[50]The American Naturalist (Salem, Mass., 1870), Vol. III, p. 540; Note.

[51]Eaton, George F.: The Prehistoric Fauna of Block Island, as Indicated by its Ancient Shell-Heaps, The American Journal of Science (New Haven, Conn., 1898), Vol. VI, pp. 143 and 147-148.

[52]Hay, Dr. O. P.: On the Finding of the Bones of the Great Auk (Plautus impennis) in Florida, The Auk, 1902, Vol. XIX, pp. 255-258.

[53]Great Auk Notes, The Auk, 1888, Vol. V, p. 232.

[54]Hardy, Fanny P., Testimony of Some Early Voyagers on the Great Auk, Ibid., p. 384.

[55]Op. cit., p. 148.

Bay and the junction of the Cape Cod peninsula with the mainland."[56]

CONCLUSION.

In these days when much stress is quite naturally laid on the economic value of scientific work, it is pleasing to know that archæology, aside from what many may consider its purely academic interest, is also, as I think I have succeeded in demonstrating above, of indirect value from an economic standpoint. There is, of course, a reciprocal dependence of one science on another—archæology depending on zoology for the determination of animal remains and zoology on archæology for useful osteological material.

One of the main points to be remembered is that archæology in order to be truly scientific and most useful to other sciences, should be conducted in a thorough manner by trained, or at least competent, investigators and not by mere collectors of curios or other irresponsible parties, who destroy more useful material than they succeed in preserving.

[56]Forbush, E. W., A History of the Game Birds, Wild Fowl and Shore Birds of Massachusetts and Adjacent States. (Issued by the State Board of Agriculture, 1912), p. 406.

TYPES OF CANADIAN CARICES.

BY THEO. HOLM, CLINTON, MARYLAND, U.S.A.

For nearly thirty years the writer has enjoyed the great privilege of receiving botanical collections from the Canadian Government at Ottawa. These collections, mainly brought together by Professor John Macoun, and his son, Mr. James M. Macoun, represent an immense number of Phanerogams from the Pacific to the Atlantic slope and extending far north to the Arctic regions. Although extremely rich in species of all the natural families known from Canada, these collections, nevertheless, made it evident that one genus appeared to have interested these gentlemen more particularly than most of the others. It so happened that the genus *Carex* has been, and is yet, the favorite one of the Macouns. Naturally the collectors laid special stress on the numerous species of this genus, and it is due to the great experience and skill of these gentlemen that their collections of *Carex* have been more rich in species than similar collections brought together by botanists in general.

As a matter of fact to collect Carices is a most difficult task, at least when the aim is to have the species represented at different stages, typically and less typically developed, and to show the enormous variation exhibited by many of the species. The object of the Macouns was not merely to collect specimens, but individuals in large series of developmental stages. Many new and rare species were discovered, *Carex petricosa* Dew., and *C. Franklinii* Boott, never collected since Drummond, were brought home last year by James M. Macoun in magnificent specimens. Last but not least, the geographical range has been extended year after year and it has been shown that the genus possesses many species in Canada of extremely wide distribution, not a few being circumpolar, and many ascending from the lowlands to the alpine regions of the Rocky Mountains. And a point of special importance is that great care was taken to consider the variation of the species, which is common to many of these, when inhabiting different localities at different altitudes, and associated with certain species. In this way a broader view has been gained, and the systematist has been guided to appreciate the power of the species to adapt itself to the environment, instead of increasing the already untold number of species supposed to be specifically new, but actually being mere forms or varieties. Many instances illustrating this fact might be mentioned, but we shall confine ourselves to a few. *Carex spectabilis* Dew., was never known before except as the typical plant, described by Dewey, but James M. Macoun gathered the species in Jasper Park, Alberta, at a number of stations, and proved the species to be one of special interest with respect to variation, influenced by the environment. Such very inconspicuous species as *C. scirpoidea* Wormskj., *C. nigricans* C. A. Mey., *C. pratensis* Drej., *C. gynocrates* Wormskj., *C. lejocarpa* C. A. Mey., and a host of others are now known and understood better than ever before through the painstaking studies in the field by John and James M. Macoun. Even the remote districts in Yukon, explored by John Macoun, have proved rich in Carices, of species closely allied to each other of the same alliance as a number of North European species, the *rigida*, *aquatilis* and *acutina alliance*, in Europe so excellently outlined and described by Elias Fries, Laestad, Blytt and others.

To the writer of these pages these collections have been of the same value and interest as to the Macouns, inasmuch as he for many years, has given special attention to the same genus in Europe and

the United States. However, our knowledge of the American element of the genus we owe almost exclusively to the Macouns, through their familiarity with the genus and correct determinations. The liberal gifts of well selected material in connection with, so to speak, a most indefatigable correspondence has enabled us to draw a concise comparison of the Old World and American representations of *Carex*.

Most prevalent in the north, even beyond the Arctic Circle, and at high elevations in the mountainous districts, the genus has proved of special interest to the student of plant geography and of the migration of species during the glacial epoch, to be traced now through the circumpolar element, mingled with types of southern origin. And the vast distribution of the genus has resulted in the production of types utterly unlike each other, when comparing the supposed ancestral with those of more recent origin. The outlining of the genus in natural greges we owe to Elias Fries, Tuckerman and Salomon Drejer, who laid the foundation of demonstrating the natural affinities, instead of following the usual tendency to arrange the species in accordance with superficial characters in a mere analytical way. And, while all other Caricographers considered the "*Indicae*" distinct from "*Vigneae*" and "*Carices genuinae*" Drejer in his excellent work "*Symbolae Caricologicae*" combined these, the "*Indicae*" with the two others; thus the "*Indicae*" may be looked upon as representing evolute types of greges of both *Vigneae* and *Carices genuinae*. Furthermore Drejer demonstrated the probable affinities of the species within the greges, considering the monostachyous as "*formae hebetatae*" passing into the "*centrales*" the typical of the grex, and culminating in some more evolute with some deviating types, the so-called "*descis-centes*." By this logical arrangement the monostachyous species became transferred to various greges, instead of as formerly constituting one most unnatural section with no other feature in common than possessing a single spicate inflorescence, the pistillate, or a spike, the staminate.

Now with respect to Canadian types of the genus, it is interesting to see that of the 39 greges enumerated by the writer[1] only five are absent from Canada; these greges are as follows: *Psyllophorae* (Europe and Azores), *Chionanthae* (Europe), *Leucocephalae* (Virginia), *Echinochlaenae* (Australia), and finally *Podogynae* (Japan).

As regards the greges present the *Microrhynchae*, *Acorastachyae*, *Echinostachyae* and *Physocarpae* are the best represented, being rich in species and of very wide distribution.

But of special interest are a number of types represented among the various greges, types of a very characteristic structure. These we will describe briefly in the same order as the respective greges (l.c. p. 453). A tristigmatic *Vignea*, *C. nardina* Fr., by Boott named *C. Hepburnii* has been collected on mountain summits of Alberta and British Columbia. Some of the *formae hebetatae* of the *Astrostachyae; C. gynocrates* Wormskj. and *C. exilis* Dew., have been known as varying from monoecious to dioecious; of these the former confined to Greenland and this continent is undoubtedly most commonly monoecious in the north, judging from the specimens we have examined which were collected in Northern Labrador. British Columbia, Alaska and Greenland; in the last place we found this species probably at its most northern limit Skarvefjaeld on the island of Disco, about 69 N. lat. where it occurred only as monoecious. A still more evolute stage is represented by *C. exilis*, which in Canada occurs as monoecious or dioecious, mono —or plio—stachyous. A gynaecandrous[2] spike is frequently met with in this species, besides that the female plant may possess several lateral spikes, from one to six, at the base of the terminal. Among the centrales of this grex we find *C. stellulata* Good., *C. interior* Bail., *C. sterilis* Willd., widely distributed and clearly demonstrating a natural alliance of true species, although of very close relationship. The very peculiar and rare *C. sychnocephala* Carey of the grex *Sychnocephalae* is also a native of Canada, and only one Old World species is known of this grex, *C. cyperoides* L.; they both are very much alike, showing exactly the same habit. Among the *Xerochlaenae*, *C. macrocephala* Willd., with its dense and remarkably large inflorescence occurs on the coast and islands of Alaska, and this *Carex* is tristigmatic, although a typical member of *Vignea*. Very peculiar is the Canadian representative of *C. teretiuscula* Good[3] with its large and frequently ramified inflorescence. Among the *Athrostachyae*, *C. festiva* is represented by a multitude of forms, and is widely distributed in the mountains; a very interesting alliance is composed of *C. pratensis* Drej., *C. pestasata* Dew.,

[1]Greges Caricum (Studies in the Cyperaceae) American Journal of Science, Vol. XVI, 1903, p. 445.

[2]The term gynaecandrous is applied to spikes with both sexes represented, the pistillate flowers being situated above the staminate; the opposite position occurs in androgynous spikes, where the staminate flowers are situated at the apex of the spike, the pistillate at the base. Formerly the term andrygynous was used to signify both cases.

[3]It is very unjust to accept the name C. diandra Schrank in place of Goodenough's C. teretiuscula, since Schrank's material upon which he established the species was mixed, containing also C. paradoxa Willd. and C. paniculata L.

C. adusta Boott, and *C. liddonii* Boott, besides *C. aenea* Fernald, all of which have been collected in Canada, and at a number of remote stations. Even the monotypical grex *Microcephalae* with *C. capitata* L. occurs in Yukon and Alaska, extending eastward to Alberta, Hudson Bay and Greenland.

Among the Carices genuinae the Melananthae is one of the most interesting greges; the *formae hebetatae* with their sessile spikes, and the terminal being gynæcandrous resemble certain *Vigneae* (*C. alpina* Sw.), and a corresponding distribution of the sexes occurs in several species of the centrales; *C. atrata* L. and its allies. In Canada *C. alpina* Sw.[1] is known from the higher mountains; *C. atrata* L., the typical plant, has been collected at several stations by James M. Macoun, notably in the mountains of Alberta, Jasper Park, but a near ally of this, *C. ovata* Rudge (*C. atratiformis* Britton) is much more frequent especially on the Atlantic coast, nevertheless it is absent from Greenland, where it is replaced by the typical *C. atrata*. The very evolute type *C. Mertensii* Presc., in which the numerous spikes are gynaecandrous, is known from the western districts, British Columbia and Alaska. A very singular type of this grex is *C. Parryana* Dew.; it may occur as dioecious, with a single spike; which, however, seems constantly to be pistillate; or the culm is terminated by a gynaecandrous seldom purely staminate or pistillate spike, while there may also be one to four lateral spikes which are purely pistillate. *Carex Parryana* was described from specimens collected by Dr. Richardson at Hudson Bay, but has since been reported as abundant in the northern part of the prairie region, extending from Portage la Prairie to near the Athabasca river. From the mountains of Alberta, Jasper Park, James M. Macoun brought home a splendid series of *C. spectabilis* Dew., illustrating the various forms under which it appears, when inhabiting different altitudes, and stations with environment of varied nature. These interesting forms together with the typical plant have, so far, only been observed in Washington, Mt. Paddo, where they were discovered by Mr. Wilhelm Suksdorf. A species of somewhat remarkable habit is *C. microchaeta* nob., which John Macoun collected in Yukon; in this species the culm is phyllopodic, otherwise the plant resembles somewhat *C. Tolmiei* Boott, and *C. spectabilis* Dew., but is, however, of a much more robust habit.

Passing to the *Microrhynchae*, Canada is very rich in species of this grex, and several of these are of abundant occurrence; *Carex stricta* Lam., *vulgaris* Fr., *acutina* Bail., *variabilis* Bail., and *lenticularis* Michx., are perhaps the best known. Typical *C. vulgaris* Fr., is known from Alaska, British Columbia and from the eastern provinces, but the variety *lipocarpa*, nob., is much more frequent, and readily to be distinguished by the narrow leaves and the early deciduous perigynia; this variety abounds on Vancouver Island, in British Columbia and Yukon at various elevations. The variety *stolonifera* Hoppe has been collected in Labrador. Another and quite striking variety is *limnophila* nob., which resembles *C. rufina* Drej., the culm being low, curved and the spikes contiguous with the terminal occasionally gynaecandrous. It has been found on St. Paul Island, Bering Sea, and on a nunatak in Columbia glacier, Prince William's Sound; still another variety *hydrophila* nob., from Yukon is a very slender plant, with long stolons clothed with shining, purplish brown scale-like leaves, the spikes are peduncled, cylindric, dense-flowered and erect; finally the variety *strictaeformis* Bail. occurs in Nova Scotia; it is of caespitose habit, quite tall and slender with the sessile spikes remote and subtended by short bracts. In other words *C. vulgaris* shows in Canada the same ability to vary as is the case with the European plant, but, in several respects it varies in a different way. For instance the long stipitate, strongly nerved perigynium is not represented in the European plant, nor is the perigynium early deciduous as is the case with our common variety *lipocarpa*.

C. aquatilis Wahlenb., has been reported from a number of stations in Canada, and it is sometimes accompanied by some closely allied species, in Yukon by *C. sphaccelata* nob., and *C. chionophila* nob.; in the Arctic regions it is replaced by *C. stans* Drej. While *Carex rigida* Good. is common in the Arctic regions, it has also been reported from some of the higher mountains in British Columbia, and the variety *Bigelovii* (Torr.) Tuckm., is known from the Hudson Bay region. Two allies of *C. rigida: C. consimilis* nob., and *C. cyclocarpa* nob., are natives of Yukon; in the former the orbicular perigynium is sharply denticulate along the upper part of the margins, but the habit reminds one of *C. hyperborea* Drej.; in *C. cyclocarpa* the perigynium is turgid of a dark brownish green color

[1]The name C. alpina Sw. has been replaced by C. Halleri Gunn., in Gray's New Manual of Botany, because Schinz and Theilung have adopted this name (Bull. d'herb. Boissier, Vol. 7, 1907). However Gunner did only "pro tempore" propose this species, and without his name as author. After his death his herbarium was examined, and as stated by several Swedish authors, Gunner's material contained not only C. alpina, but also C. Norvegica, thus the name Halleri became invalidated. No other authors have, so far, called the species C. Halleri, and surely the old masters knew they had some good reason for ignoring this name.

with purplish spots above, and the caespitose habit reminds one of *C. caespitosa* L., but it lacks the aphyllopodic structure of this species.

Allied to *C. acutina* Bail. is *C. limnocharis* nob. from Yukon ,a species with long, slender, pistillate spikes of reddish brown color, in habit much like the European *C. prolixa* Fr. Furthermore there are two very characteristic species bearing a strong resemblance to the European *C. acuta* L., *C. Sitchensis* Presc., known from Alaska, and *C. dives* nob., from the Chilliwack Valley and Vanvouver Island, British Columbia. And, if we compare the European representations of these alliances, the *aquatilis, rigida* and *acuta*, we meet with analogous types corresponding with those of this continent.

The large grex *Aeorastachyae* is also well exemplified in Canada, and several of the species are also well known from the northern parts of Europe, viz, *Carex subspathacea* Wormskj., *C. salina* Wahlenb., *C. cryptocarpa* C. A. Mey., *C. maritima* L., *C. Magellanica* Lam.[5] *C. limosa* L., *C. rariflora* Sm., and *C. stygia Fr.* Of these *C. subspathacea, rariflora* and *stygia* extend to the Arctic regions.

But especially characteristic of this continent are *C. macrochaeta* C. A. Mey., *C. nesophila* nob., *C. aperta* Boott, *C. crinita* Lam., and *C. magnifica* Dew. A somewhat peculiar habit is exhibited by *C. nesophila;* the culm is phyllopodic and the spikes resemble those of *C. salina*, while the structure of perigynium corresponds with that of *C. macrochaeta*. This interesting species was detected by James M. Macoun on St. Paul Island, Bering Sea, and since then it has also been collected on Popoff Island by Mr. Trevor Kincaid.

Although exceedingly frequent on the Alaskan coast and the islands, *C. macrochaeta* shows but slight variation. The terminal spike is usually wholly staminate, but we found, however, a few specimens from Unalaska in which this was either androgynous or gynaecandrous or even entirely pistillate. In the variety *emarginata* nob., the scales are prominently emarginate with a seta four times as long as the body of the scale.

In another variety *macrochaena*, nob., the plant is very robust with four short and heavy pistillate spikes, the perigynium is very large and longer than the simply mucronate scale; it was collected on St. Paul Island, Bering Sea, by James M. Macoun. These varieties agree, however with the typical plant with respect to the culms being constantly aphyllopodic.

Among the *Cenchrocarpae* we meet with the interesting little species *C. bicolor* All., reported from Alaska, Yukon and British Columbia, besides from Labrador; it occurs also in Greenland, and on the Alps in South Europe. Much more frequent is *C. aurea* Nutt, and among the desciscentes we meet with *C. granularis* Muhl., *C. pallescens* L. and the very local *C. Torreyi*, Tuckm.

From a morphological viewpoint the *Lejochlaenae* constitute one of the most interesting greges with their monopodial shoots and aphyllopodic culms. They are mostly sylvan types of light green color, and the more or less drooping spikes give them a very graceful aspect. Nearly all the American members are represented in Canada, and while *C. Hendersonii* Bail. is a western type the others are mainly eastern. We meet here with the *laxiflora* alliance, as well as with some *desciscentes: C. grisea* Wahlenb., *C. oligocarpa* Schk., *C. conoidea* Schk., and *C. glaucodea* Tuckm.

The *Dactylostachyae* are much less common, and altogether poorly represented on this continent; Canada, however, is the home of the beautiful little species *C. concinna* R. Br., *C. pedunculata* Muehl. and *C. Richardsonii*, R. Br.

Some few species of the small grex *Microcarpae* are represented in Canada, viz: *C. gracillima* Schw., and *C. formosa* Dew. Characteristic of the *Athrochlaenae* is the scales being deciduous of the perigynia being prominently stipitate and reflexed at maturity It is a very small grex containing only two species, *C. pyrenaica* Wahlenb., and *C. nigricans* C. A. Mey. Both are found in Canada and the geographical name of the former certainly proves very unfortunate, inasmuch as the species occurs also in New Zealand. A grex closely allied to the *Athrochlaenae* is that of the *Stenocarpae* so far as concerns the structure of the perigynium, being attenuated at both ends, relatively narrow, and the generally dark colored spikes. It is a grex

[5]With respect to C. Magellanica Lam., this species has been excluded from the North American flora, and in the recently published, Gray's New Manual of Botany it has been replaced by C. paupercula Michx on the strength of the diagnosis of Lamarck calling for a species with androgynous spikes, as pointed out by M. L. Fernald (Rhodora, Vol. 8, 1906, p. 73). And Mr. Fernald having examined 633 inflorescences and finding that in 600 of these the terminal spike was purely staminate, and only more or less androgynous in the remaining 33, this author reaches the remarkable conclusion that the North American species is distinct from Lamarck's, which was collected on the shores of the Straits of Magellan. The fact is, however, that Lamarck (Encyclop. 3, p. 385, n. 25) described his species "spicis androgynis," meaning that all the spikes, the terminal as well as the lateral, had staminate flowers at the base thus beneath the pistillate flowers. In C. Magellanica the spikes are, thus, gynaecandrous, i.e., pistillate at the top, staminate at the base and exactly this disposition of the sexes occurs in the North American and European representations of C. Magellanica. The main point, that the lateral spikes are constantly gynaecandrous has escaped the attention of Mr. Fernald, although Boott, Schkuhr and nearly all other caricographers have described and figured the species correctly. The fact, that the terminal spike is frequently purely staminate is of no importance.

of very peculiar geographic distribution since two of the *formae hebetatae: C. lejocarpa* C. A. Mey., and C. *circinata* C. A. Mey., are known only from Alaska and Oregon, besides some few stations on the coast of British Columbia. The *formae centrales* on the other hand, are mostly natives of the European Alps and the Himalayas, some very few occurring in Canada, viz: C. *petricosa* Dew., and C. *Franklinii* Boott., furthermore C. *Lemmonii* Boott (C. *ablata* Bail.) occurs at several stations in Canada, Washington, Montana and California. Among the *formae* desciscentes is the circumpolar C. *misandra* R. Br., which occurs in the Rocky Mountains of Colorado extending northward through the Canadian provinces.

Nearly all the American members of the *Sphaeridiophorae* have been collected in Canada, and among the *hebetatae* C. *scirpoidea* Michx., with the variety *stenochlaena* nob., is quite extensively distributed. The Greenland C. *deflexa* Hornem., occurs in Canada, but is generally confounded with C. *Rossii* Boott.; however, these two species are easily distinguished, since the culms of C. *Rossii* are aphyllopodic, those of C. *deflexa*, on the other hand, phyllopodic.

The rather large and coarse species of the *Trichocarpae* are in Canada represented by C. *riparia* Curt., var *lacustris* Willd., C. *trichocarpa* Muhl., with the var. *aristata* (R. Br.) Bail., C. *filiformis* L., C. *lanuginosa* Michx., and the very characteristic C. *Houghtonii* Torr. These species are, however, of a very ordinary structure, but readily distinguished by the perigynium being of a brownish or dark green color, more or less turgid, pubescent and attenuated into a bidentate beak with the sharp teeth spreading.

Of greater interest is the grex *Hymenochlaenae*. Here we meet with some *formae hebetatae:* C. *Steudelii* Kunth, C. *Willdenowii* Schk., and C. *Backii* Boott, of which the flowerbearing culms are ramified in exactly the same manner as in the *Indicae*, the *Vigneastra* of Tuckerman.[6] The more evolute types resemble, on the other hand, *Carices genuinae* in general, but they are mostly light green, with the spikes long-peduncled and drooping. The best known are, for instance, C. *arctata* Boott, C. *debilis* Michx., C. *longirostris* Torr., C. *flexilis* Rudge, C. *capillaris* L., C. *assiniboinensis* W. Boott, and the singular, very conspicuous, C. *amplifolia* Boott. The presence of these species in Canada thus illustrate the fact of the morphological structure of the flower bearing stem being identical with that of certain members of the highly developed *Indicae*, as pointed out above, in C. *Willdenowii* for instance. In passing to the *Spirostachyae*, only a few are known from this continent, and some few of these from Canada, viz: C. *Oederi* Retz., C. *flava* L., C. *squarrosa* L., and the very rare C. *fulva* Good., the last of which being less rare in Europe.

As representing the most evolute of the greges we have the *Echinostachyae*, *Physocarpae* and *Rhynchophorae*. In these the perigynium is thin, membranaceous and inflated. In the *Echinostachyae* the pistillate spikes are peduncled, drooping and squarrose at maturity, the beak of the perigynium is quite distinct bidentate.

Two small monostachyous species: C. *microglochin* Wahlenb., and C. *pauciflora* Lightf., represent *formae hebetatae*, and both occur in Canada. Among the *formae centrales* we meet with the very slender C. *subulata* Michx., and the much more conspicuous C. *pseudocyperus* L., C. *Schweinitzii* Dew., C. *hystricina* Muehl, and C. *rotrorsa* Schweinnitz, all well known in Canada, with the exception of C. *Schweinitzii*, which is very rare.

Characteristic of the *Physcocarpae* is the perigynium having a very short, mostly emarginate beak, and the pistillate spikes not being squarrose, moreover the scale of the pistillate flower is lanceolate, acuminate, but lacks the mucro or arista of the two other greges. It is an interesting grex, and widely distributed in Canada, but several of the species are, sometimes, difficult to identify, especially those with the dark colored perigynia, for instance: C. *pulla* Good., C. *physocarpa* Presl., C. *compacta* R. Br., and C. *rotundata* Wahlenb. They are very graceful species with the shining, dark brown spikes frequently peduncled and drooping. Of a more robust habit and with the spikes of a lighter color are C. *utriculata* Boott., occurring in numberless forms throughout Canada, furthermore C. *vesicaria* L., C. *oligosperma* Michx., and a few others.

Finally the grex *Rhynchophorae* characterized by the large, erect or ascending perigynia, much inflated, strongly nerved and terminated by a prominent, bidentate beak. The species are tall, and of the same habit as those of the two former greges and like these they are inhabitants of borders of ponds, creeks and wet swamps. The grex begins with some *formae hebetatae*, C. *Michauxiana* Bœcklr., and C. *folliculata* L., passing from these into C. *intumescens* Rudge, and C. *Grayii* Carey, of a similar but much more robust habit, while the more ordinary forms, such as C. *lupulina* Muehl., C. *lurida* Wahlenb., C. *Tuckermannii* Boott, and C. *monile* Tuckm., may be considered as the most

[6]Holm, Theo., Studies in the Cyperaceae, XIII Carex Willdenowii and its allies (Am. Jour. of Sc., Vol. X, July, 1900, p. 33).

evolute of this grex. In Canada the grex is thus well represented, and only a very few American species are absent.

Considered altogether the genus *Carex* in Canada is rich in types, some being confined to this continent, others being known also from Eurasia. The arctic element Canada shares mostly with Europe, and as stated above several species are circumpolar, and it deserves attention that many of these Canadian *Carices* represent alliances analogous to those of the old world, exmplified by types of a corresponding habit and general aspect.

So far as concerns the greges we have seen that Canada is the home of certain ancestral types, *formae hebetatae*, which are absent from Europe, in other words several of the greges are more amply represented here by possessing these types in connection with the *centrales*, and passing gradually into some more or less deviating: *desciscentes*.

The presence in Canada of such characteristic species as those of the *Lejochlaenae*, mostly sylvan types of rare morphological structure, and of southern origin, indicates the enormously wide distribution of the genus on this continent, and its ability to adapt itself to the environment, far north and far south. And the alpine flora with its arctic species intermingled with endemic or more southern types is a tangible proof of the foundation of the theory relating to the history of the arctic flora during the glacial epoch.

HUNTING THE BARREN GROUND GRIZZLY ON THE SHORES OF THE ARCTIC.

By H. F. J. LAMBART, OTTAWA.

One specimen of the Alaska Boundary Grizzly, *Ursus internationalis Merriam*,* a new bear of the Barren Grizzly group, was secured in July, 1912, when engaged on the survey of the 141st meridian. This was the year in which the meridian was completed through to the shores of the Arctic Ocean. Not more than two other specimens were seen by the Canadian and American parties during the summer although signs of the bear were constantly met with.

This one specimen was secured by mere chance. One of our camps was situated in a sheltered valley which later was found to be a favorite haunt as evidenced by the quantity of hair found in the gum of the small spruce against which he was accustomed to rub. This sheltered ravine was at the head of a small stream in which there was a luxuriant shrub growth, consisting of "buck brush" with some small scattered spruce, and was hemmed in by rolling high barren ridges. The elevation of the floor of the valley was about 2,000 feet above sea level and was situated just a little on the Canadian side of the boundary and inland from the Arctic Ocean 45 miles.

The immediate district may be described as being under the lea of the British mountains, which parallel the coast at a distance of about 25 miles and reach an altitude of 6000 feet at the boundary; the mountains are deeply furrowed, the ridges being bare and open with little vegetation.

The burrows of the Arctic Ground Squirrel, *Citellus parryi* (Richardson), are sadly rooted out throughout the district casting suspicion on our friend the bear.

The floor of the river valleys are, generally speaking, heavily brushed as also the sheltered sides of the valley, and small patches of the small Arctic spruce in these localities are frequent.

I have definitely proved to my own satisfaction that the Brown and Grizzly bears prey upon the sheep *(Ovis dalli)* at the southern end of the boundary where they are found in large numbers, but here at the northern end where the sheep are very

*Alaska Boundary Grizzly. Ursus internationallis Merriam, Proc. Biol. Soc. Washington, xxvii, pp. 177-178. August 13, 1914.

Type locality—Alaska—Yukon Boundary, about 50 miles south of Arctic coast (lat. 69° 00' 30").

Type Specimen—No. 1763 ad., Ottawa Museum. Killed July 3, 1912, by Frederick Lambart, of Canadian Boundary Survey.

Range—Region bordering Arctic coast along international boundary, and doubtless adjacent mountains, between the coast and the Yukon—Porcupine; limits unknown.

Characters—Size medium or rather large; affinities doubtful. Color a peculiar pale yellowish brown. Head strongly arched; muzzle and frontal region broad. Large lower premolar strictly conical, without heel, as in the brown bears.

Cranial characters—Skull of medium size, massive, strongly arched and dished, highest over anterior part of braincase; frontal shield broad, very short pointed posteriorly sulcate medially and swollen over orbits; postorbitals bluntly rounded, strongly decurved, not widely projecting; frontonasal region strongly dished; rostrum large and broad; sagittal crest long but feebly developed; zygomata subtriangular, not widely outstanding, and not much expanded vertically; palate and postpalatal shelf rather broad; notch moderate. Teeth rather small for size of skull; heel of last upper molar small and obliquely truncate on outer side; large lower premolar strictly of brown-bear type—a single cone without heel, sulcus, or posterior cusplets; first lower molar broad and somewhat sinuous; middle lower molar narrow and short posteriorly.

Skull measurements.—Adult male (type): Basal length, 309; occipito-nasal length, 293, palatal length, 169, zygomatic breadth, 203.5, interorbital breadth, 82.

scarce, no signs of their having been attacked or preyed upon were seen.

Around the camp at the time there were a number of cayuses from the pack trains apparently entirely ignored, although one report came in of a case where one whole train was stampeded.

The specimen referred to above was shot early in the morning in the brush of the southern slopes of the valley very near the camp, mistaken by one member of the party for one of the cream colored cayuses. He was quietly strolling along unconscious of the presence of any danger and killed instantly with a .303 military cartridge at close range. The bullet having mushroomed to nearly an inch in diameter was found lodged in the outer skin, which had acted like a rubber sheet absorbing the remaining spent energy of the bullet.

I am glad to say the skin was carefully preserved at the time and the skull cleaned. The pelt was naturally not in prime condition but, however, now forms a valuable specimen in the bear collection of the Victoria Memorial Museum at Ottawa.

The color of the hair is a very light brown, darker on the back and shoulders. The head is very wide and the nose long.

The large brown bear frequenting the margins of the glaciers on the southern end of the boundary, as well as the little black variety, was encountered.



ALASKA BOUNDARY GRIZZLY, Ursus internationalis Merriam.

Some interesting experiences could be sketched of these latter, their unbounded curiosity often getting the better of their natural instincts to danger, with the result that they have been known to walk into camp during the day as well as at night and ransack everything if the camp was found to have no occupant at the time.

BIRD STUDY FROM A DUCK-BLIND.

By J. A. MUNRO, OKANAGAN LANDING, B.C.

A day's tramp in the hills usually has for an objective, a lake or slough, or a mountain-top to reach before turning homeward and after a few hours' travel, this becomes the dominant idea. One cannot sit down to watch a bird for any length of time, as the lake or slough of one's destination urges haste. One obeys the impulse and passes on, losing, it may be, a chance of learning some secret of avian psychology.

But when hidden behind a screen of brush or rushes on some pleasant lake shore, the mental attitude is that of expectancy and curiosity only. To become an inconspicuous part of the blind, that screens us from the sharp eyes of passing waterfowl, is now the object. One's predatory instincts counsel immobility and silence, so there is no impulse to move and one has the maximum of opportunity for observation. While following the flight of a bird until it is lost to view or watching with close attention, the numerous waterfowl that swim past the blind or feed within the range of binoculars, the gun is frequently forgotten. The band of scaups that swim past the blind, leaning against the breezes at an angle that reveals their white underparts and then fly straight out over the lake, until, a row of vanishing dots, they melt into the horizon, have appealed to other than the sportsman's eye. The impulse is to watch rather than shoot; the carefully built blind and the decoys swinging at their anchors to leeward have served the bird lover rather than the sportsman.

October in the Okanagan is a month of golden cloudless days and starlit nights. To-day, the 7th (1918) the lake is unruffled by the slightest breeze and on the glassy surface, there is a perfect unblurred replica of the surrounding hills. There is no frost, but the early morning air is keen and one's fingers grow numb grasping the canoe-paddle. This intimation of the cold days to come is forgotten when the first shafts of sunlight cut through the belt of firs on the mountain-top. As the sun rises higher, bathing the western hills in a flood of golden light, that creeps lower and lower until every tree stands out in relief, and as the mist-wraiths over the water are drawn up and dissipated, one can see little evidence of autumn, save the bold splashes of yellow along the shore-line where the cottonwoods are turning.

The blind is built on the edge of a narrow sandy beach, close to the mouth of a small creek that pursues its indolent course through a wide valley of farm land and brush to the north. One hundred yards from the water, where the beach merges into the meadow, there is a thicket of deciduous trees, poplar, birch, alder and willow. From this shelter come the voices of a few late migrants; the faintly heard "chirp" from the last of the Audubon's Warblers and the stronger, more metallic calls from a band of Gamble Sparrows.

The lake is dotted with grebes, Western, Holboell, Horned and Pied-bills. The Horned Grebes are quite fearless; seven swim in among the decoys and alternately dive for food or preen their already immaculate plumage. Alarmed by a gun-shot, they fly, splashing along the surface for thirty or forty yards, when they alight again and huddle in a compact flock, as if for protection. In a few minutes they paddle back to rest among the decoys. Their plumage seems to be in need of constant attention; when not feeding, they are usually oiling and combing their feathers, sometimes lying on the side, one foot above the surface and bill buried in the glistening breast.

The other small species, the Pied-bill, which is much less common here, does not visit the decoys. They are more easily alarmed than the Horned Grebe, and at a sudden movement sink below the surface until only head and neck are visible, then with a rapid look to either side disappear, leaving scarcely a ripple.

The two larger species are much more wary and keep some distance out from the shore. The Western Grebe with its long slender neck and hair-like plumage, suggest reptilian ancestry more than do the other species. Paddling towards one is an interesting experience. Before being alarmed they float high on the water, conspicuously black and white; as the canoe draws near, they turn and swim straight away, showing only the black upper parts which blend with the dark water. The head is carried stiffly erect on the long straight neck and there are frequent quick glances backward. A few yards nearer and they dive with a quick clean flip. Many of these birds are suffering from a wasting disease, probably due to the presence of intestinal parasites in large numbers. The actions of the sick birds identify them at once. They swim slowly close to the shore as a rule and dive only when actively pursued, to arise exhausted within a few yards.

In the presence of their handsomer cousins the less conspicuous Holboell receive only a cursory inspection. Those that pass the blind to-day are all juveniles, with dark greyish back, spotted breast

and lacking the characteristic red neck of the adults.

The lake at noon is like a polished steel disc and a faint heat haze shimmers on the surface. Through this medium the grebe are seen as distorted shapes, suspended a foot above the water, or so it appears. Presently a faint breeze comes; the surface breaks into millions of scintillating points of light; the decoys bob up and down and make short journeys to the length of their anchor lines. The steamer ties up at the dock two miles away and the small flock of Herring Gulls that attend its daily voyage take this opportunity for a prowl along the shore, on the lookout for dead kokanees or squaw-fish. This is their daily habit. When the mid-day voyage is over they rest on the water opposite the dock until the steamer leaves in the morning then rise slowly one by one and follow with their leisurely tireless flight, keen eyes ever on the alert for the scraps that are thrown overboard from the cook's galley.

For several hours, a flock of twelve Green-winged Teal have been feeding in the shallow water, behind the thin line of rushes twenty yards out from the shore. They are very nervous, rising every few minutes and swinging out over the lake several times before pitching in again. With what marvellous speed can they check their headlong flight and drop twisting and turning down to the water! After one of their periodic flights they settle in the shallow water and from there waddle on to the beach and feed along the windrows of *Potamogeton* that drifted in during yesterday's storm. This mass of water weeds is full of the small crustaceans and insects so eagerly sought for by surface-feeding ducks and the Teal glean the abundant harvest until a passing wagon puts them to flight.

A brown Marsh Hawk, a bird of the year, flies along the beach with business-like flight, alternately flapping, or sailing on set wings. He is overtaken and routed by several hostile crows and departs in a panic, twisting and dodging across the beach until he reaches the sheltering brush where he loses his pursuers. Crows are arriving in small bands and settle on the beach close to the water's edge, some two hundred yards from the blind. These are only the forerunners of a great noisy stream, that pass in a long straggling line, some high in the air, others close to the ground. Soon the beach is black with a cawing multitude. This is the great pre-migratory caucus; only a few of these will winter in this part of the valley. Four birds arriving by themselves are attracted to a muddy stretch of beach near the blind: they swerve from the main flight and alight in the oozy mud near the water's edge where some dead kokanees have washed in. As they feast on these a passing merlin sees them and unnoticed, stoops like an arrow. He misses or perhaps decides that the quarry is too formidable so swings in a wide circle and settles on the top of a dead poplar in the brush, while the crows fly off with squawks of alarm and join their fellows farther down the shore.

Apparently crows do not expect enemies to appear from the water as one can approach in a canoe within a few yards while the appearance of a man on foot is the signal for their hasty departure.

The lake is still again and woolly cumulus clouds gather in the south, several sweet-voiced Mountain Bluebirds alight on the beach, their backs vividly blue against the dim-colored sand. For several minutes they quietly hunt for spiders among the debris of the beach and then continue on their way, calling as they fly.

The Osprey that yearly raises a brood in the vicinity and whose fishing grounds lie off this beach is lingering at this favored spot although the two young of her brood departed a week ago. Her clear whistle is heard at a distance, but the bird is not seen. In the shallow water fifty yards from the blind stand a number of upright fir logs, once used as mooring-posts by a long-since defunct saw-mill. One of these has been used for several summers by the Osprey as a resting place and a convenient perch on which to tear up the fish that were for her own consumption.

From far out in the lake comes the single note of a Loon, mellowed and subdued by the distance. An American Merganser swims past, neck curved and head below the surface watching for the little kokanees that are running up the creek to spawn.

A straggling flock of soft-voiced Pallid Shore Larks come drifting down the beach, like a cloud of autumn leaves blown by the wind. They flutter in a circle around the blind, alight for a moment and run to the water's edge, but without bathing or drinking they are away again like a flash, for no apparent reason. On all sides they pass, with slow undulating flight, so close, that the breath of air from their wings is felt on the cheeks. Again and again they return, always rising again before the binoculars can be levelled in the hope of picking out a Longspur among them. A short half-mile to the west, rising abruptly for a thousand feet above the lake is the bare hillside where they feed; they come to the beach only for gravel and water. It is curious how all the alpine or northern breeding birds that travel in large flocks, Rosy Finches, Shore Larks, Snow Buntings and Pipits, have this restless habit of circling and wheeling before alighting, and of flying off suddenly again in nervous haste.

A month later there is a decided change in the

aspect of the surrounding hills. Much of the color has gone; the narrow wooded coulees, that were like tongues of flame against the brown grassy slopes, are now subdued in color and merge with their surroundings. The leaves have fallen, only the delicate tracery of naked branches is seen. Along the shore line, the cottonwoods are still a blaze of orange, but many of their leaves have fallen too and cover the ground with a rustling golden carpet. The higher mountains, Terrace, Goat and Silver Star, are crowned with glittering snow-caps and the close ranks of fir for some distance below the bald summits are frosted with the silver of the first snow. As yet, there is no frost in the valley, so sitting motionless in the blind entails no discomfort and bird-life is still plentiful enough to absorb all one's attention. In the brush to the north, a Western Meadowlark is whistling, his clear flute-like notes as vivid as if it were April instead of November. A flock of brown backed Juncos are flitting through the trees or alighting on the sand and in the alders a sweet-voiced crowd of Pallid Goldfinches have gathered.

From far down the beach comes the unmistakable sonorous call of a Sandhill Crane, decidedly a belated migrant. He flies slowly along the shore with splendid slow wingbeats, head carried well forward, the neck slightly curved and legs held stiffly behind. He is attended by two softly-flying Short-eared Owls, that follow a few yards to the rear. As the crane nears the blind, he becomes suspicious and bears off to the north, the owls still following. He reaches the beach again in a wide circle and once more flys towards the blind, hesitates again and after rising higher in the air flys off, first to the north and then to the west where he is lost to view against the neutral-colored background of the hills. The owls do not follow but fly back towards the grassy meadows from whence they came and as they pass the blind, the sunlight burnishes their tawny wings until they shine like gold.

Along the eastern shore line, about two hundred yards out from the beach, a great flock of Redheads have congregated over a bed of *Potamogeton* and their feeding call, a cat-like *meow* comes softly across the water. Into this large raft, small flocks are continually flying, one sees a succession of splashes on the still water as the birds hurl themselves in and are carried by the momentum of their flight for several yards along the surface. Many of the new arrivals are Scaups and these feed among the flock of Redheads, but the Canvas Backs as a rule feed only with others of their kind. A big flight of these occurred during the past few days. It is rarely one sees more than a dozen at one time, but during this migration flocks of twenty or thirty were common and probably two or three hundred were present at one time. As they readily fly toward the half-dozen canvass-back decoys, it is plain they are new-comers.

Close to the fringe of rushes on the shallow water near shore, a band of fifteen Ring-neck Ducks alight and immediately begin to feed. They are new arrivals and hungry; frequently all are below the surface together. More than half of them are drakes and as they rise to the surface, the white barred bill and the white triangle on the chin serve as diagnostic field-marks. The strings of weed brought to the surface trailing from their bills are hurriedly gulped and they dive for another mouthful. After feeding for forty minutes, their appetites are satisfied, so they rest on the surface for ten minutes longer, dressing their feathers and then paddle in regular alignment to the deep water and safety.

A single female Scaup swims towards the decoys, calling at regular intervals with a singular unduck-like voice, *kuk-coo, kuk-coo.* The first syllable too short and explosive, the second exactly the coo of a pigeon.

Small bands of Buffle Head fly past, seldom more than two or three feet above the water. They swerve down to the Redhead flock but usually carry on a little beyond them, to the shallow water. The strikingly black and white adult drakes are in the minority. The young drake can be told from the ducks by their greater size, otherwise they are identical. When diving for food they are amazingly quick in their actions, coming to the surface with more buoyancy than other diving ducks. They are equally quick in the air, rising with a spring and without the preliminary splashing one associates with diving ducks.

Four Killdeer are heard down the beach and presently they fly past the blind conspicuous and noisy, to alight again a few yards away where they seem to disappear into the sand, so well do the neutral colored backs harmonize with the beach.

The half-dozen Herring Gulls that make a daily pilgrimage in the wake of the steamer have been joined by an equal number of the smaller California Gulls. These are fully adult birds with immaculate breasts that are visible from a long distance as the birds rest on the water. Red-shafted Flickers, Magpies, a Northern Shrike and a Kingfisher visit the beach during the day and in the evening outlined against a pastel tinted sky appears a triangle of Canada Geese, southward bound—a fitting climax to a perfect day.

BOOK NOTICES AND REVIEWS

THE GAME BIRDS OF CALIFORNIA. Contributions from the University of California, Museum of Vertebrate Zoology. By Jos. Grinnell, Harold Child Bryant and Tracy Irwin Storer. Univ. of Cal. Press, Berkeley, 1918, large 8 vo. pp. i-x plus 1-642, 16 colored plates and 94 text figures. Price, cloth, $6.00 net.

This is one of the most notable bird books and one of the handsomest examples of popular bookmaking that has been published under the auspices of a public institution in some time. It is a credit to the University and Museum in whose name it appears, as well as to the printer who executed it and the artists and authors who illustrated and wrote it. It contains a greater mass of game bird life histories both original and compiled probably than any other work generally accessible. The colored illustrations consist of some of the best work from the brushes of Louis Agassiz Fuertes and our talented countryman, Major Allan Brooks. The many line drawings scattered throughout the text to illustrate critical points are exceptionally accurate, clean and clear. The introduction states that the work was undertaken to meet the varied requirements of the sportsman, the legislator and the naturalist and was made possible through the financial munificence of a patron who refuses to make his (or her) name known. California is to be congratulated on having such public-spirited citizens.

In an opening chapter dealing with the Decrease of Game and Its Causes it is definitely proved that game has decreased and an analysis is made of the contributing factors. Tables of game that have passed through the hands of dealers have been obtained directly from their own books and are presented in evidence. These numbers are ample evidence of the drain on wild life that market hunting entails. Other agencies of decrease are logically and calmly discussed giving due weight to their effects pro and con with convincing restraint.

The next chapter, on the Natural Enemies of Game Birds, discusses the effects of vermin and other enemies and incidentally corrects a number of common preconceptions of their relative values.

The Gun Club of California is a chapter all conservationists should read. Arguments are given on both sides to show that the subject is not a simple one to be answered offhand. Parallel columns giving detrimental and favorable effects are contrasted and the result summed up in the final paragraph, saying:

"It would appear that the institution of well regulated gun clubs, occurring as it has, at a critical stage in the adjustment of natural to artificial conditions, is to be looked upon as a propitious rather than an adverse factor in the conservation of our duck supply. Whether or not, as further changes result from the increased human population, this valuation of the preserve will persist, remains to be seen"

The History of the Attempts to Introduce Nonnative Game Birds in California, is an illuminating chapter, and deserves study by all who contemplate such introductions elsewhere.

The Propagation of Game Birds is an equally important chapter and includes a valuable bibliography on the subject.

The last chapter of the introductory part gives the history and present status of legislation relating to game birds in California.

The Key to the Game Birds of California seems an admirable instrument. It is clear and concise and notable for the absence of obscure or technical terms and is such that any one of ordinary intelligence should be able to get results with it.

The main part of the book is, of course, occupied with the detailed treatment of the various species in their systematic order. The descriptions of plumages are unusually complete and clear, paragraphs on Marks for Field Identification, Voice, Nest, Eggs, General Distribution and Distribution in California of each one are given, and all are admirably arranged, paragraphed and picked out by distinctive type for ready reference.

The discussions of the species include much original material, but also the most complete series of excerpts from other authors dealing with the life histories and other pertinent matter of the various species that can anywhere be found under one cover.

The method of such a tripartite authorship wherein each does that for which he is specially fitted is the ideal one in dealing with a broad subject wherein no one man can be an equal authority in all directions and the course is here amply justified by the results

This book should appeal especially to bird students, sportsmen and conservationists of western Canada as whilst it deals most particularly with California, the bulk of it is equally applicable to British Columbia and it forms the work that most nearly fulfills far western needs that has so far been published.

P. A. TAVERNER.

ERRATA

Page 51, Vol. XXXIII, Sept., 1919, delete word "late" in bottom line of right column.

Page 57, Vol. XXXIII, Sept., 1919, 11th line, left column, for "crescentic spot of purple," read "crescentic spot on purple."

THE CANADIAN FIELD-NATURALIST

VOL. XXXIII. NOVEMBER, 1919. No. 5.

CANADIAN SPHAERIIDAE.

By The Hon. Mr. Justice Latchford.

There are few more fascinating objects of study in natural history than the members of the family of small bivalve mussels known as the *Sphaeriidae*. They abound in the vicinity of Ottawa, and indeed throughout the whole Nearctic region. The drainage area of the Great Lakes, and of their outlet, our own St. Lawrence, may be regarded as the metropolis of the family in North America. Yet, as Dr. Vincent Sterki recently pointed out,[1] the fauna of the Great Lakes themselves is only fragmentarily known; but, so far as known, presents many peculiar forms and possibly species. Still less are we acquainted with the fauna of the vast areas northward, extending from Newfoundland through Labrador and across Canada to the Rocky Mountains. In Prince Edward Island, Mr. C. Ives, of Miscouche, has collected a few species. In the vicinity of Ottawa, in Ontario and Quebec, considerable work was done many years ago by the members of the Ottawa Field-Naturalists' Club, especially by Gilbert Heron, Dr. Fletcher, the Rev. Geo. W. Taylor, and the writer. Officers of the Geological and Natural History Survey, notably Mr. W. McInnes, gathered some material in the waters flowing into Hudson Bay. Little, however, is known of the family as it exists over the far-flung plains of the Canadian West. In Southern British Columbia, Lord found and described two new species,[2] and farther north, and on Vancouver Island, Prof. John Macoun and Mr. Taylor collected in a few localities.

Heron died before reaching the prime of his promising manhood. Fletcher, Taylor and Whiteaves passed away all too soon—not, however, without having accomplished and recorded achievements in various departments of natural science that will long keep their memory green. Of those who were active in the early days of the club in collecting and studying the mollusca of Canada only two remain, Prof. John Macoun and the writer. One is spending the decline of his fruitful life in distant Vancouver Island. The other for ten months of the year is far removed from his native valley and concerned about matters but little related to natural history. Owing to lack of a leader, Conchology has for some years been dropped from the list of the club's activities. With such wide and productive areas open for original investigation, the want of interest shown is greatly to be regretted. It is not so much to publish a record of work as a member of the club as to arouse fresh interest in others, and to facilitate the collection and study of our most numerous and least known shells that the following observations are submitted. My hope is that some of our younger members may be induced to devote a part of their leisure to what I am sure they will find a delightful diversion, both out of doors and over their cabinets.

The *Sphaeriidae* are small in size, only a few species exceeding half-an-inch in length. As they ordinarily lie buried—though only slightly—in the sand or other material at the bottom of streams, ponds and lakes, they are seldom seen—never, indeed, unless where, in very dry seasons, the water has receded or evaporated, when the shells may sometimes be observed on the exposed surface. But so generally are they distributed that it might almost be said they are to be found—they should certainly be looked for—wherever there is water that is not within the category known to golfers as "casual." Yet mere depressions that contain water for but short periods in any year often yield these and several other fluviatile shells.

To collect in quantity, except under conditions which seldom exist, a dredge of some kind is required. The beginner will find that a common bowl-shaped wire strainer will best serve his purpose. The size I find most useful has twelve meshes to the inch, and is six inches in diameter. I remove the handle and rim, which are too flexible and soon break, and substitute narrow, stiff, hoop-iron; but good results may be obtained without making such a change. The handle must be extended for all but very shallow water by whipping it firmly to a walking cane or light pole. On sifting in water the material raised by the dredge the shells will be

[1] Annals of the Carnegie Museum, Vol. X, 1916, p. 431.

[2] Proc. Zoo. Soc. of London, 1863, p. 69.

found. Each lot should be kept separate and numbered. A brief record under the same number on a field card or in a note book should be made. If the shells are stained they may be cleaned by placing them in a bottle containing sharp sand and soapy water. On no account should an acid be used. By rotating the contents the shells will be cleaned on the outside. Mere drying out then suffices, when the shells are minute; but when large, the animals must be removed after boiling, or rendered innocuous by immersion overnight in a five to one dilution of formalin—by far the more rapid process, as the tying or wrapping of each shell is not then necessary. When thoroughly dried, after treatment with formalin, the largest shells will not gape, or cause offence by their odor, and may be placed in the collector's cabinet.

As he examines his specimens he will observe that they fall naturally into three groups or genera. By far the greater number ordinarily found are minute shells, triangular in outline, very unequilateral, and, with rather sharp terminal beaks. They resemble small peas, and belong to a genus fittingly called *Pisidium*.

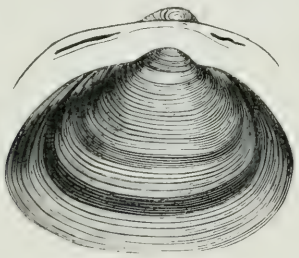


Fig. 1
Sphaerium sulcatum × 1½.[3]

Other shells will be noticed which are larger, less inflated, though never exceeding half an inch in length; and usually more delicate and fragile. They bear little caps on the beaks, separated from the aftergrowth by a distinct furrow, and form the genus known as *Musculium*.

Still larger shells, often adorned with distinct color bands, denoting periods of arrested development, and others of no greater size than some *Musculia*, but of heavier texture, and as a rule more deeply striated, bear *Sphaerium* as their generic name. The term was devised by Scopoli, an Italian naturalist and chemist in 1777. It has priority to *Cyclas* (Brugaiere, 1789); and *Sphaeriidae*, according to the laws of modern zoological nomenclature has replaced *Cycladidae* as the proper designation of the family to which the little mussels belong.

1. SPHAERIUM SULCAIUM Lamarck, the largest of the genus in the species most commonly observed in the vicinity of Ottawa. It was described in 1818 by the famous French naturalist in his "*Animaux sans Vertèbres*," from specimens obtained in Lake Champlain. In the same year Thomas Say described the shell in the American edition of Nicholson's Encyclopedia as *Cyclas similis*, and Say's name may have priority. However, the Lamarckian name is more generally adopted, and is that used in the Club's lists.

S. sulcatum is the largest of the genus. It is oval in outline; distinctly, rather than deeply, striate; and, when adult, is usually banded with concentric dark lines, marking periods of arrested development such as occur every winter. The body color is of varying shades of grey or brown. Young shells are almost white.

But one other species, restricted in Canada, so far as known, to a single locality near Ottawa, approaches this in size. All bivalves found elsewhere that are about three-quarters of an inch in length, and have not the corrugated beaks which indicate membership in the family of our large mussels, or *Unionidae*, may safely be named *Sphaerium sulcatum*.

This species is found in many places within the city limits. It is common in the Rideau river, especially on the muddy bottom of the reach above the islands at Billings' Bridge. In the canal, after the water has been let out, it may be easily collected on the shoal near the right bank west of the Bronson avenue bridge, and anywhere above Hartwell's locks. Very large and perfect shells were obtainable at one time in the bay at the east end of the small lake below the outlet of Meach lake; but owing to accumulations of sawdust and bark the locality is now barren of this shell, though it still produces sparingly the most remarkable specimens I have ever seen anywhere of *Anodonta cataracta* Say (=*fluviatilis* Dillw.) and, in addition, *Lymnaea megasoma*, and the shell called *Physa lordi* in our lists.

In the Laurentides, north of Meach lake, *S. sulcatum* abounds, as in Gauvreau lake and its outlet, near Ste. Cecile de Masham, and in the brook flowing past the orchid swamp still farther north, so well known to members of the botanical branch of the Club, and now, alas! to many others. What a day that was, nearly thirty years ago, when, after visiting the brook and its outlet, Fletcher, Harrington and the writer were the first naturalists to discover the sequestered glades where the shy wood nymphs, then literally in thousands, swayed to one another in virgin grace and loveliness! Whoever studies shells should have a mind receptive to the

[3]For this and the other figures in the text I am under the greatest obligation to my friend Dr. Bryant Walker of Detroit, Mich.

delightful impressions that may be derived from flowers and birds, and the many strange four and six-footed creatures that he will encounter on his rambles in places seldom frequented by man.

A very fine form of *S. sulcatum* occurs on the Scott Graham farm in Nepean, now called Britannia Highlands. In dry seasons the narrow bottom of the stream lying about halfway between Carling Avenue and the Grand Trunk railway is exposed for some distance west of the boundary of the Shouldis farm. The shell may then be easily found in considerable numbers. At other times collecting is slow and difficult, even though the collector is equipped with a good dredge, and—what are indispensable in such localities—rubber boots. This stream is again productive near its outlet into the Ottawa below the Deschênes rapids.

conditions of environment. In fact nothing is so wonderful in nature as the adherence to type of every organized being properly regarded as a species. More interest is, however, manifested in departures from the normal than in persistence of type, just as variant races of men, like the giant Patagonians and pygmy Papuans, commonly attract more attention than races of ordinary stature. Variations from the usual form of *S. sulcatum* are few and limited. One is found in Bond lake, near Toronto. Another, which is well marked and constant, occurs in Masham, north of Ottawa, and, notably, in Lake Gorman, near Brudenell, in the county of Renfrew, at an elevation of about eleven hundred feet above sea level.

Dr. Sterki thinks it entitled to rank as a variety and calls it *palmatum*.[1] He describes it as smaller

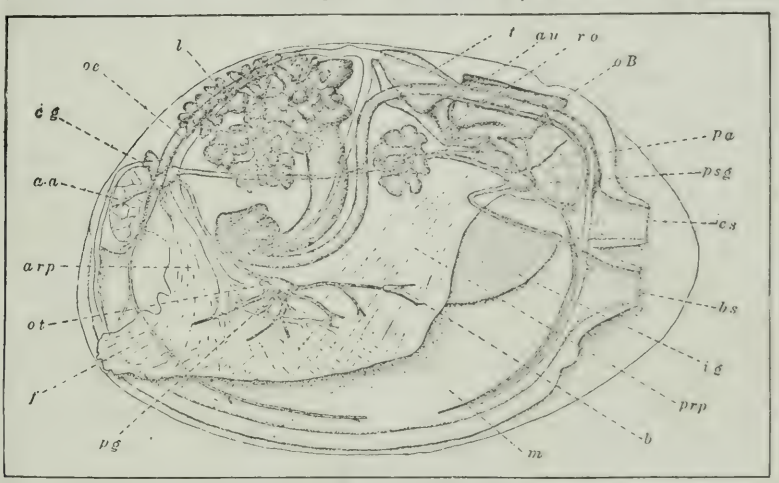


Fig. 2.

a.a.—Anterior adductor muscle.
a.p.—Ant. retractor-pedis muscle.
ar.—Auricle.
b.—Byssal gland rudiment.
bs.—Branchial siphon.
ġg.—Cerebral ganglion.
cs.—Cloacal siphon.
f.—Foot.
ig.—Inner gill.
l.—Liver.
m—Mantle.
ob.—Organ of Bojanns.
oe.—Oesophagus.
ot.—Otocyst.
pa.—Posterior adductor muscle.
pg.—Pedal ganglion.
prp.—Post retractor-pedis muscle.
psg.—Parieto-splanchnic ganglion.
ro.—Reproductive organs.
t.—Male follicle.

Fair specimens are obtainable in shallow water at Graham Bay station, at the intersection of the Richmond road and the Grand Trunk railway. A few miles farther to the southwest the shell is common in the creek north of Stittville; but nowhere have I found it in such numbers as in the stream about a hundred yards west of Ste. Justine station, in the county of Vaudreuil. In either place the shell may be readily collected in large numbers by means of a dredge with a quarter-inch mesh, such as is afforded by a kitchen utensil in common use.

As *S. sulcatum* is a true species, with an objective existence not depending on the opinion or whim of any systematist, it does not vary greatly in its characteristic features throughout the vast area over which it is desseminated, though it is occasionally modified in appearance by different

than the common or typical *sulcatum*, more inequipartite, the beaks being markedly anterior; less inflated, especially flattened over the lower part of the valves, more truncate anteriorly and posteriorly, inferior margin less curved; beaks narrower and little elevated; surface striae slighter; shell and hinge slighter.

In Lake Gorman the shell is quite abundant buried about an inch in the sand of the bay near the boathouse on the Rockingham road.

The animal of the variety *palmatum* has not been described. It is probably not distinguishable from the normal form represented in the following illustration, which may be regarded as typical of the anatomy of all the genus:

[1]Preliminary Catalogue of N. A. Sphaeriidea, An. Carg. Mus., Vol. X (1916), p. 432.

The foot is capable of great extension as may be observed if living shells are placed in a glass bowl or aquarium. Cilia in the bronchial siphon, and along the inner and outer gills and mantle, induce currents which bring diatoms and other minute organisms contained in the water into contact with the libial palpi, whence they pass into the stomach to be in part elaborated for the preservation and growth of the individual and the propagation of its kind, and in part rejected through the excurrent or cloacal siphon.

Unlike the *Unionidae* in which each individual is dioecius, that is, either a male or a female, as is the case also with our native oyster *(O. virginica,* Gmelin), though not, strange to say, with its European relative *(O. edulis,* Linn.), *S. sulcatum,* like all other species of the *Sphaeriidae,* is monoecious, or produces both sperm and ova within the same shell. However, it is not harmaphroditic in the way that many, if not all, pond and other snails are hermaphroditic. In their case, while each animal is perfectly bisexual, the conjunction of two individuals is requisite for fertilization. In the *Sphaeriidae,* on the other hand, the process of fertilization is similar to that which takes place within the closed keel of the pea blossom and other legumes. Cross fertilization is impossible naturally, and could not be induced artificially were another Mendel to arise. The reproductive organs are located behind the stomach, and consist of racemose glands, the anterior of which produces sperm, and the posterior ova. A common genital duct leads in the cloacal chambers of the inner gills, where the young reach before birth, in the case of this species, a length of seven or eight millimeters, or nearly half that of the father-mother.[5] If living shells are left for a day or two in water that is warmer or colder than that of their usual habitat, they will, ordinarily, be found to have produced a large number of nepionic young. These should be separately boxed and labelled with the name of the parent and will be found very useful when the collector is trying to identify shells which are no larger when aged than some Sphaeria are at birth.

(To be continued)

[5]The reproduction and growth of S. sulcatum are treated at length by Ralph J. Gilmour in The Nautilus, Vol. 31 (1917), pp. 16-28.

Note.—It is my intention to place in the Museum of the Geological and Natural History Survey at Ottawa specimens of the forms and varieties of S. sulcatum, and of the species mentioned in the continuation of this paper, of which I possess duplicates.

FIELD STUDY OF LIFE-HISTORIES OF CANADIAN MAMMALS.[1]

BY RUDOLPH MARTIN ANDERSON, BIOLOGICAL DIVISION, GEOLOGICAL SURVEY, OTTAWA.

A recent and timely publication of the United States Department of Agriculture[2] calls attention to the gaps in our knowledge of the habits of many of the commoner species of mammals. The study of birds has been developed so extensively in a popular way in recent years through the Audubon Society movement, local bird clubs, and nature studies in the public schools, as well as technically by the scientific ornithologists, that the objects and methods of bird study have become fairly well known throughout the country, and the economic importance and aesthetic and sentimental value of bird life are becoming matters of common knowledge.

The study of mammals, though not less important in many ways, has not been developed so broadly or systematically. The study of the comparative anatomy and physiology of the major mammalian groups, through their closer relation to the human subject, has received close attention, but the relations of species to one another and to their environment, and their life-histories, are undoubtedly less well known than the like relations of birds. It is true that the horse, cow, sheep, pig, and a few other mammals have been domesticated, but few attempts have been made to domesticate other species except in a sporadic way. A rather extensive but scattered literature has been developed concerning the deer, elk, moose, bison, antelope, and other large game animals, which are of interest to the sportsman. Unfortunately, this in many cases consists principally of the lore of hunting field and methods of capture, and what may be termed their more intimate history has been neglected until many of the species have been exterminated over most of their former ranges, and it is forever too late to obtain complete data in regard to these animals' relations to their primitive condition. Where efforts have been made, often too late, to conserve a remnant of these animals, to replenish the game of the sportsman, add to the food supply, or for other practical or sentimental reasons, it is found that there is a lamentable lack

[1]Published by permission of the Geological Survey, Ottawa, Canada.

[2]Suggestions for Field Studies of Mammalian Life-Histories. By Walter P. Taylor, Assistant Biologist. September, 1919. U.S. Department of Agriculture. Department Circular 59. Contribution from the Bureau of Biological Survey, E. W. Nelson, Chief; pp. 1-8.

of knowledge even of an elementary kind regarding their habits.

Intimate knowledge of the furbearers was left largely to the trapper, whose interest usually did not extend beyond the means of outwitting the animal during the trapping season, putting its pelt on the stretcher or drying-board, and increasing his own personal fur-return for the time being. As the furbearers have become reduced in numbers, and the prices of fur have increased, the importance of the fur industry to the country is becoming recognized; measures of conservation are being proposed, and fur-farms are being started, the practical success of which depends largely upon the application of a knowledge of life-histories or habits of the animals which are to be reared.

Many species of animals which have no direct economic value as food or for their fur, or skins, are nevertheless often of enormous indirect importance, and must be recognized as beneficial, or means taken to combat them as detrimental to the interests of man. Rats, mice, ground squirrels, etc., have been recognized as carriers of trichinae and the germs of bubonic plague, anthrax, and other diseases. Ground squirrels, prairie dogs, pouched gophers, and other rodents have caused such extensive damage to grain-fields, running into millions of dollars annually in some parts of the country, as to make necessary concerted action by the government and by associations of individual farmers. Rabbits, hares, voles (field-mice), and the like frequently cause great damage to fruit trees and young forest trees. Coyotes, wolves, and mountain lions take a large toll of the sheep, cattle, and horse-raising industries, and thousands of dollars had been expended in indiscriminate bounties without commensurate results until systematic study of these carnivorous pests pointed a way for their practical elimination in many districts.

The ravages of "The house rat, the most destructive animal in the world," are given by Lantz (Yearbook of the United States Department of Agriculture, 1917), from studies made by the Biological Survey in 1908, as amounting to actual losses in produce and other property in one year in the two cities of Washington and Baltimore, of $400,000 and $700,000 respectively, the sums being nearly in ratio to the population. In the same report he quotes a recent statement of the Women's Municipal League of Boston to the effect that losses from the rats in that city amounted to $1,350,000 annually. Losses in Pittsburg, Pa., have been estimated at over $1,000,000 a year, and no doubt the present values of produce would greatly increase these estimates.

While the study of the living animal is of as great interest and attractiveness to the naturalist as any other branch of natural history and has consequently an aesthetic and sentimental value, it can be shown to have a very practical value also. As Professor Herbert Osborn says: "Not a single farm product but is affected directly or indirectly by some animal activity."

Dr. Taylor, in his recent paper, states that the leading museums have been acquiring exhibits and studying material representatives of different groups of birds and mammals, until at present the American collections are in many respects unsurpassed by those of any other country in the world, and that the relative completeness of research collections permits increased attention to be paid to the study of life-histories.

It is, of course, well recognized that species closely resembling each other often have quite different habits, and to avoid misapprehension and confusion of records we must have a certain amount of systematic taxonomic study before detailed investigations can be made along other lines. Valuable observations may be made without drawing the lines of differentiation too finely, but in general, we must learn the names of our animals before we can write about them. In other words, we must have pegs on which to hang our observations, if they are to be of value.

Unfortunately, we must admit that there is not in Canada today any collection of mammals approaching in completeness, even in Canadian species, several collections in the United States, among which may be mentioned the Biological Survey and the United States National Museum of Washington, the American Museum of Natural History of New York, the Museum of Comparative Zoology of Cambridge, and possibly two or three others. Many American zoologists have worked in Canada for the enrichment of American museums, and Canadian naturalists have done intensive work in many districts, but many regions of Canada have even yet been little worked in the field of mammalogy.

The development of a national collection of the mammals of Canada, as well as of other forms of animal life, should be of interest to all Canadians. Such a collection is useful as a place of reference for students from all parts of the country, and a permanent repository for specimens of many species which may ultimately become extinct. In addition to the national collection, represented by the Victoria Memorial Museum, under the Geological Survey, of the Department of Mines, each province should have a representative collection of the mammals and other vertebrates found within its borders. The private collector has a field of his own for investigation and experiment which should be en-

couraged, for he often has opportunities, resources, and freedom to carry on important investigations along side paths of knowledge which the government investigator or professional naturalist is not able to follow at his own inclination. The universities, colleges, and other schools, scientific surveys and commissions, local museums and associations for the protection of fish and game, all have an opportunity to do good work for the country in this field.

The value of detailed knowledge in fields which have previously appeared seemingly trivial, has been illustrated many times during the late war. As an example of this, the pest of rats became exceedingly serious at the Bush Terminal of the port of New York, the principal shipping point of the immense amount of stores required for the American or other expeditionary forces of the Allies. The use of poison was impracticable around such great quantities of food stuffs, but by detailing field biologists to the Sanitary Corps and directing their field experience to the problem of exterminating rats, within a few months more than 50,000 rodent allies of the enemy were accounted for, and it is estimated that several million dollars worth of commissary and quartermaster stores were saved at a critical time.

The secretive and nocturnal habits of some species of small mammals are responsible for so little being known of them. They are correspondingly more difficult to photograph than the birds. For this reason field photographs of mammals—their nests, runways, tracks, and general habitat, are particularly desirable. Although the mammals as a rule are more shy than the birds, and are less often seen; the larger animals on account of constant pursuit by man for generations as objects of sport and of food, and the smaller ones from fear of swooping birds of prey, the presence of the mammal in a certain region may be detected where the flying bird leaves no trace. The pads of little paws on dusty roads or the muddy brinks of pools or streams, or the delicate tracery of tracks on the newly fallen snow, leave a record, which though evanescent, may be read and interpreted by the initiated, and lends interest to walks in the great out-doors.

In a field like this no one can cover every detail, and the notes of many persons are needed for working out complete life-histories of any species, even the commonest. A young observer may find out something that was not known before and, in classic phrase, "add something to the sum total of human knowledge." As a suggestion to aspiring naturalists who are at a loss to know what to do or how to begin, we can not do better than quote from Dr. Taylor's paper cited above:

DATA THAT ARE IMPORTANT.

MEANS OF DETECTING PRESENCE OF PARTICULAR SPECIES.

"Tracks, distances between footfalls; differences in tracks with different speeds or movements of animal.

Feces—abundance, shape, size, color, composition, place of deposit.

Claw marks on trees, logs, or ground.

Tooth marks on wood or bone.

Wallows, dust baths, beds, forms, nests, shelters, runways, holes, trails, cropped or harvested vegetation.

HABITAT RELATIONS.

Relation of soil, rocks, water, air, climate to habits and distribution.

Effects of unusual climatic conditions, as storms, floods, and forest fires; degree and rapidity of recovery from disaster.

Relation of animal populations to climatic cycles.

INTERRELATIONSHIPS OF SPECIES.

Friends.

Enemies—times of activity; enemies in youth, middle age, old age.

Prey—modes of capture.

Parasitic habits of species with reference to each other.

Parasites, internal and external.

Bacteria and disease germs (carriage and transmission of disease to stock or to mankind; species as victims; decimation of animal populations; periodicity of contagious diseases in animals; degree and rapidity of recovery).

Adaptations of animals to each other or to plants.

Competition between species, particularly between those closely related.

TIMES OF ACTIVITY.

Hours of beginning and cessation of daily activity.

Unusual activity, as of diurnal species at night or of the nocturnal by day.

MIGRATION.

Local or general movements before and after breeding.

Dates of appearance and disappearance (especially of bats).

Extent and direction of movements, local and general.

Causes of migration—food supply, climatic, physiological.

Unusual migratory movements, as the spasmodic irruptions of lemmings, with causes therefor.

HIBERNATION AND ESTIVATION.

Date of entering upon and emerging from hibernation.

Causes of hibernation and estivation—the relation of climate, soil, physiology, and food supply.

Condition of animal before, during, and after hibernation.

Details as to completeness or incompleteness of torpidity.

Place of hibernation or estivation.

Habits associated with hibernation and estivation.

MOVEMENT.

Modes of running, jumping, climbing, digging, swimming, flying.

Gait; speed; endurance.

Other activities.

VOICE AND OTHER MEANS OF INTERCOMMUNICATION

Calls in general; courting; alarm; challenge; warning calls.

Descriptions of barking, baying, screaming, howling, squeaking, squealing, singing, roaring, bugling.

Warning attitudes; flash signals.

Emission of glandular secretions.

Odor posts.

Touch.

Other means of intercommunication.

Organization of communities—leaders, sentries, rank and file.

HABITS ASSOCIATED WITH FEEDING AND DRINKING.

List of foods eaten.

Food at different seasons.

Physical characteristics and habits associated with food getting.

Conveyance and storage of food; hay making.

Dependence on water; times and manner of drinking; other associated habits.

INDIVIDUAL CHARACTERISTICS.

General disposition and temperament; intelligence; attitudes; strength; vitality; tenacity of life; courage; esthetic sense; eating of young by parents; cannibalism in general; degree of sociability; playfulness; length of life.

Sanitation, cleanly or filthy habits.

Reactions to sound, light, odor, taste, touch.

Relation of physical characteristics to sense reactions.

RELATION OF CHARACTERISTICS AND HABITS TO EXISTENCE AND SURVIVAL.

Movements.

Attitudes.

Instincts.

Intelligence.

Coloration—concealing, disruptive, directive, warning, mimicking.

BREEDING HABITS.

Courting antics.

Relations of the sexes in general; polygamy (manner of acquisition of harem by male, mode of protection of harem, bachelor males); polyandry; promiscuity; monogamy.

Dates of heat and copulation; associated habits.

Length of period of gestation.

Date of birth of young.

Number of young.

Family life; relation of father to family; care of young—feeding; mode of carrying; how long cared for by parents; precocious or backward; length of time in nest; behavior.

Behavior of adults in postbreeding season; in winter.

Hybridization between related species.

NESTS, SHELTERS, AND OTHER PLACES OF RESORT.

Natural resorts at different seasons.

Shelter chambers in general.

Lairs; dens; forms; beds.

Nests—plan, elevation, accurate measurements; storage chambers; breeding chambers; chambers for deposit of excrement or for other purposes.

Nests for different purposes; unoccupied nests.

Approaches to nests—trails, burrows, tunnels, or runways; protection of nests through the closing of burrows during the daytime or in other ways.

Habits associated with nest approach.

Extent of home range.

MISCELLANEOUS.

Are any mammals strictly crepuscular?

Periodic phenomena of any kind of mammals, aside from migration and hibernation.

Habits as affected by the seasons of the year.

Effect of long days, very dark days, full moon, dark of the moon, on activity.

Use of glands of various sorts, as hip glands of meadow mice, metatarsal glands of deer, musk glands, anal glands.

Weights and dimensions of bats; precise hour of appearance in the evening and disappearance in the morning; numbers and habits as observed in caves; relative numbers of the sexes; methods of hanging; condition of females with reference to pregnancy.

PRESENT AND FORMER STATUS.

Present and former numbers of valuable species, as fur-bearing and game animals, and of pests or those otherwise important; causes of increase or decrease.

Estimates and counts of numbers of animals per unit of area.

Fluctuations in numbers from year to year, and causes.

Plagues, due to unusual increase or destructiveness of species; origin, course, and virulence; natural checks and methods of control.

WILD LIFE AND THE COMMUNITY.

Local names; local ideas concerning wild life.

Sentiment regarding game laws and legislation.

Trapping and hunting methods in local use; prices received for pelts or animals sold.

Relation of mammals to the public health; to agriculture.

Possible undeveloped resources in mammals, as of flesh for food, fur or hides for clothing, or other useful animal products for various purposes.

Possibilities of utilization, through domestication or semidomestication, of beneficial species."

No one individual can hope to acquire full information on all the items listed, but any naturalist who knows a species at all can put down something, and apparently trivial things often turn out to be really important when considered in their relation to other factors. "These relative lines of inquiry include problems in scientific agriculture, geographical distribution, phenology, migration, ecology, physiology, medical zoology, behavior, game protection and the conservation of natural resources, morphology, heredity, organic evolution, and economic zoology."

The Division of Biology (Mammalogy), The Geological Survey, Ottawa, Canada, is interested in building up a collection, and in gathering of life-histories and other data in regard to the mammals of Canada, and correspondence is solicited from any person or institution working along these lines, and advice or suggestions will be gladly given as opportunity is offered.

BIRDS IN RELATION TO SUNFLOWER GROWING IN MANITOBA.

By Norman Criddle, Treesbank, Manitoba.

There are several indigenous species of sunflower in Manitoba some of them such as *Helianthus maximiliani* being weeds of importance while others merely add to the attractiveness of the landscape, without being otherwise of interest to mankind. All, however, have their values in the economy of nature and for ages past have proved a valuable source of food supply for certain native birds, as well as for several rodents While animals thus take heavy toll of the sunflower seeds, they also assist materially in the spread of the species and it seems at least possible that these unusually large seeds have been evolved for just such an end. In other words, the plants offer an especially attractive food, in return for which the animals carry a certain indefinite percentage of the seeds far beyond the range that they would otherwise fall—an unconscious form of reciprocity very commonly met with in the realms of nature.

Under the ordinary course of events, the conditions depicted above might have continued almost indefinitely, but, as frequently happens, man has intervened. Sunflowers have become of economic importance from the human standpoint, the larger ones for their seeds and the smaller kinds for fodder purposes; this apart from the fact that many are grown in gardens as ornamental plants We have, therefore, to view the relations of birds to sunflowers in another light presumably, again placing the economic importance before the aesthetic. This I have endeavored to do in the following sketch. My observations are drawn largely from notes made in a garden and refer especially to a bushy type of sunflower originated by my brother Stuart. It seems well to mention also, that the garden is surrounded by shrubs and young spruce trees, planted to shelter the more tender plants therein.

At Treesbank, Man., sunflowers are usually above ground by the middle of May and it is at this time that the first injury is done to them by birds which eat the cotyledons. In doing this the birds often follow the rows to the end and practically destroy every plant. The House Sparrow having a bad name, at once got the blame for this injury and we accordingly set a watch who was prepared to shoot the none too popular bird. But suspicion may be misdirected as it proved to be in this case. There was the thief at work, pulling and eating the plants, and it proved to be no other than the White-throated Sparrow, one of the most popular of all the feathered tribe No wonder the gun was lowered or that the watcher, who happened to be my brother Evelyn, should return to the house disgusted at his discovery. Later we found that the White-throat made a practice of sunflower eating and that it continued from the time of its arrival in early May until about the first of June when the nesting period commenced. Occasionally other sparrows, such as the White-crowned or Harris' Sparrow would pull up a few plants, but they were only casual depredators whereas the White-throat went in search of the plants daily. Naturally such injury would not take place in the open country though it is possible that Longspurs or other birds might prove equally troublesome under field conditions.

The injury to the newly sprouted sunflowers is over early in June and from that time no further

damage takes place until the plants commence to form seeds. This second attack commences about the middle of August and continues until the plants are harvested in early October. Four birds stand out prominently in the work of destruction at this time, namely the American Goldfinch *(A. tristis)*, the Pine Siskin *(S. pinus)*, the Crossbill, or as it is known in these parts, the Red Crossbill *(L. curvirostra minor)*, and the White-winged Crossbill *(L. leucoptera)*. The first mentioned is by far the most persistent of all of these and it is probable that fully 80 per cent of this bird's food consists of sunflower seeds when they are available. The ripening of the seeds also coincide with the Goldfinch's breeding season and in consequence the young are largely reared on the same food supply. Later as the nestlings learn to fly all find their way to the sunflower patch and from then on make their headquarters in the vicinity. To see one of these beautiful little birds resting upon a sunflower at once sets one speculating as to the probable origin of colors that harmonize so remarkably with the plant the birds feed upon. Who could possibly select a more perfect background for concealment and yet endow a bird with such brilliant colors at the same time? The females and young are also wonderfully hidden when resting upon their favorite food plant and it ,therefore, seems strange that the name sunflower bird has not been applied to this species.

While sunflower seeds unquestionably form the chief food of Goldfinches during the autumn months, the birds also consume a variety of other seeds such as Gaillardia, thistle, dandelion, and many others of composite plants. All such seeds are usually gathered while the bird rests upon the plant and the seeds dropped are seldom sought after on the ground.

Pine Siskins though not so persistent sunflower-seed eaters as their relatives the Goldfinches, are, nevertheless, quite destructive in the course of a season and when in large flocks might do serious harm. With us, however, a family or two are all that visit the neighborhood in autumn and they would not, therefore, be a serious menace to a large field, though troublesome enough in a garden where but a few thousand plants are grown. Both Pine Siskins and American Goldfinches leave us in October; the latter have all gone by about the 20th, while the former remain a week or more longer. Indeed, there are records of Siskins being seen in winter time though I have no personal records of winter birds. They return in May and breed in the woods close at hand.

The two Crossbills have such similar habits that they may well be treated as one in this article. They are, apparently, both residents throughout the year and breed in the spruce woods close by.

Crossbills are not regular visitors to the sunflowers but being great wanderers probably arrive accidentally while in search of spruce cones. Seeing the plants, however, they soon descend upon them and are quickly engaged in tearing the heads to pieces. They usually come in flocks of half a dozen or so, these being doubtless single families, as a majority are in juvenile plumage. Indeed, observation shows that the young birds are far more persistent in their depredations than the adults, and it may be that like various other birds, these have a habit when first seeking food for themselves which they later abandon for the more general one of gathering the seeds of the coniferous trees. This, however, is only partly true as I have observed perfectly colored males as busy in the work of destruction as were the young alongside.

Crossbills though not as persistent sunflower-feeders as the Goldfinches are in other respects even more injurious owing to their lack of discrimination in selecting suitable heads. They may thus tear to pieces half a dozen heads before discovering one with seeds sufficiently mature for food purposes. Under these conditions the damage done in a day is often severe. In the case of the garden referred to, the depredations become so extensive that I eventually went out with a gun, but to my joy found it unnecessary, as the handsome marauders had departed.

Of the other eaters of sunflower seeds little need be said as their influence on the ultimate production is insignificant. Blue Jays prefer the larger seeds and in autumn store them for future use. House Sparrows and other sparrows gather them from the ground as do also Mourning Doves and the various species of blackbirds. Chickadees are almost daily visitors to the sunflower patch in late autumn and during the winter. No one, however, begrudges them their tiny share and that they do feed upon the seeds is more of interest as a means of attracting them than otherwise.

This then is a brief sketch of the birds that might affect the industry of growing sunflowers, or their seeds, for agricultural purposes; none of them, however, are particularly abundant though there is no gainsaying the fact that even in their present numbers they might cause considerable loss on a large field. If the sunflower industry ever develops, as it promises to do, then it may be necessary to go further into the matter and perhaps a gun will be required. In our garden, where we were experimenting and crossing, losses, of course, had to be guarded against. For the seedlings we used various devices for hiding the plants and placed numerous

obstructions along the rows to prevent a continuous thoroughfare. As the seeds began to ripen we covered the heads with cheese-cloth. By these measures of precaution we managed to obtain sufficient seed for our purpose, which was about a tenth of the total grown, the rest going to the birds. To be permitted to watch these little robbers day after day, busily engaged in pulling out the seeds was to me, at least, sufficient compensation, and for those who love birds and gardens, I know of few better attachments than a hedge of sunflowers.

NOTES ON THE BEHAVIOUR OF THE CHIPMUNK.

By A. Brooker Klugh, M.A., Biological Dept., Queen's University, Kingston, Canada.

While in camp at Lake Missanog, Frontenac county, Ontario, from August 19 to September 19, 1919, a chipmunk *(Tamias striatus lysteri)*, had its abode in the vicinity of our tent. This individual had an unusually short tail and deep coloration, and consequently could be readily distinguished from other chipmunks in the neighborhood.

Home range. The home range of this chipmunk was 100 yards by 75 yards, and she was never observed out of this area.

Food. She was feeding on three things which I have not previously seen this species eating—the fruits of the bunch-berry or dwarf cornel *(Cornus canadensis)*, the fruits of the wild lily-of-the-valley *(Maianthemum canadense)*, and the seeds of the star-flower *(Trientalis americana)*. As far as I could ascertain she was not storing any of these articles of food.

I tried her with various food substances and found that neither meat nor sweet substances, both of which are relished by the red squirrel, were accepted, but only seeds, fruits and tubers.

By far her favorite item among the foods offered her was corn—either raw or boiled. While she sometimes ate a kernel or two she carried most of it away in her pouches. In loading up her pouches she placed the kernels alternately first in one pouch and then in the other, and when the pouches were nearly full she shoved the last few kernels in with one of her forepaws. A full load, as tested several times, consisted of thirty-one large kernels of corn—equal to two heaped-up tablespoonfuls. When full each pouch was as broad as the head, when viewed from above.

Notes. Three different notes were used by this chipmunk—the sharp "*chip*" which appeared to indicate a state of unrest, the "*chip-chir-r-r*" of alarm, and the resonant "*chonk-chonk-chonk*." The latter note is an intercommunication call and is rarely repeated for any length of time unless a response is evoked. This call is frequently begun quite softly and slowly, but when answered in kind both tone and tempo are increased. In uttering this note the cheeks are slightly distended before each "*chonk*" is emitted.

Psychology. The shortness of the period of observation made any detailed study of the psychology of this individual an impossibility, but I was able to secure accurate data on one phase of this subject—the rapidity of the formation of associations. After I had placed kernels of corn for her a few times I began to throw kernels to her. At the first trial the sudden motion of my arm in throwing naturally frightened her, as any sudden motion will do with any wild animal. At the second trial she started only slightly and came and picked up the kernels, and at the third trial she showed no alarm at the motion, but ran immediately towards me and picked up each kernel as it fell. I next threw her half-a-dozen kernels, each one nearer to me than the last, and then held out the cob near the ground, when she came up and bit the corn from the cob. After this she associated the holding out of anything with the procuring of food and came at once. The third test made was to ascertain her ability to associate sounds with the securing of food. I held out a cob of corn and made a squeaking noise with my lips, and after five trials ,two on one day and three on the subsequent day, she came running up on hearing this sound, even though I held nothing extended towards her. The rapidity with which she made these associations exceeded my anticipations very considerably.

That associations remained for some length of time was shown by an incident which was not planned as an experiment. My Indian friend, Sowatis Lachance, had given me a cob of the peculiar hybrid corn which he grows, in which the kernels are of various and brilliant colors—red, pink, purple, brown, dark grey, yellow and white. This I had placed on the top shelf of a set of shelves in the tent. Early the next morning the chipmunk came into the tent, climbed up to the shelf, and stripped the cob. For five days subsequently she continued to investigate that top shelf, visiting it

regularly every morning and usually several times during the day, though no more corn was placed there, nor anything else edible.

After the chipmunk had learned to come and take corn from the cob held in my hand she would come after it no matter where I held the cob, running up my leg and sitting on my knee while loading up her pouches, and would sit up on a cob and strip off the kernels even when I lifted the cob up in the air.

THE ORNITHOLOGICAL COLLECTOR AND THE LAW.

By Hoyes Lloyd.

As the provisions of the Migratory Birds Convention Act and Regulations which concern the scientific collector are perhaps not fully understood by all collectors in Canada, a short explanation of the status of the collector, with respect to this law, seems desirable at the present time.

The federal bird protection law, which is known as the Migratory Birds Convention Act, allows *birds protected by the Act* to be taken, shipped, transported, or possessed for scientific purposes, but only by persons holding a permit from the Minister of the Interior.

This permit is required by all museums or individuals wishing to collect birds, nests, or eggs, protected by the Act.

The director of a recognized museum should make application for each of his collectors. Individual collectors must furnish written testimonials from two well-known ornithologists before their application can be considered. Applications should be addressed to the Commissioner, Dominion Parks Branch, Department of the Interior, Ottawa.

All applicants should state the province in which they wish to collect. They may be required to make returns stating the result of their work. Every encouragement is offered the collector, who is honestly working to extend our knowledge of Canadian birds, but useless waste of bird life will not be allowed.

A package in which specimens of birds, protected by this Act, is to be shipped must be marked on the outside with the number of the permit, the name and address of the shipper and a statement of the contents. It is contrary to the law to ship any of the protected birds, eggs or nests and the use of the mails is forbidden, unless the packages are so marked.

So that every Canadian naturalist will understand the principles governing the issue of these permits, this article is concluded by repeating these principles in full. They are printed with and form a part of every scientific permit.

PERMIT PRINCIPLES.

Permits to take migratory birds, their nests and eggs, under the Migratory Birds Convention Act and Regulations are granted for the sole purpose of scientific study and not for the collection of objects of curiosity or personal or household adornment. Therefore only such persons as take a serious interest in ornithology, and are competent to exercise the privilege for the advancement of knowledge ,are eligible to receive such permits.

It is expected that the holders of permits will use them with reasonable discretion, taking only such specimens as their scientific needs require and avoiding unnecessary waste of life. The habitual taking of numbers of individuals for the purpose of obtaining a few specially desirable ones is deprecated and it is urged that the collector take no more specimens than he has reasonable prospects of caring for and will conscientiously endeavor to properly prepare each and all when taken.

It is also recommended that the holders of permits will, so far as is consistent with their object, be considerate of the local feeling in the neighborhood where they collect and will demonstrate both by actions and speech that the scientific collector is sympathetic towards the principles of wild life conservation and not the rival of legitimate sportsmen.

It is required as an evidence of good faith that holders of permits label their specimens with the customary scientific data and properly care for them not only at the time of collection but thereafter, giving them all reasonable protection against insect pests and other agencies of destruction, and will not permit them to be destroyed through carelessness or indifference.

As permits are granted for the purpose of general scientific advancement and not for individual benefit, specimens taken under them are to be regarded as being in the nature of public trusts, and should be accessible to all duly qualified students under only such reasonable restrictions as are necessary for their protection or as is consistent with the owner's work.

Finally it is urged that provision be made so that specimens taken will ultimately find their way into permanent or public collections where they will be available for study by future generations and not be wasted and lost through neglect.

While all these conditions are not strictly mandatory, and their spirit will be liberally interpreted, they will be considered in the granting or renewal of each permit, and evidence of gross violation of them may be deemed sufficient ground for the refusal of an application or for the revocation of any permit already granted.

It is hoped and expected that the justice of these principles will be realized and that collectors will co-operate in advancing science to the utmost without unnecessary waste of valuable bird life.

RIBES DIVARICATUM X RIBES LOBBII.

By J. K. HENRY, VANCOUVER, B.C.

A few years ago Mr. George H. Knight, nurseryman, Mount Tolmie, Victoria, B.C., found a peculiar gooseberry growing among *Ribes divaricatum* Dougl. and *R. Lobbii* Gray, at Mill Hill, Vancouver Island. He removed it to his nursery and propagated it. It fruited freely, as *R. Lobbii* usually does, producing claret-colored berries of excellent flavor. Finally blundering workmen grubbed it up. The plant is now known to exist only in the nursery of Mr. George Fraser, Ucluelet, to whom Mr. Knight, remembering his friend's interest in hybrids, had sent cuttings.

In April, 1919, Mr. Fraser sent me flowering specimens of the plant, which show pretty clearly that it is, as Mr. Fraser surmised, a natural hybrid between *R. divaricatum* and *R. Lobbii*. The combination of two such important characteristics as the hairy style of *R. divaricatum* and the glandular ovary of *R. Lobbii* is alone almost conclusive evidence of its parentage.

In general appearance the plant looks like a small-flowered specimen of *R. Lobbii*. It has the pubescent shoots, the triple spines, and, in its spring form, the glandular leaves and the glandular-pubescent petioles of that species. The pubescence of the mature petioles is, however, hardly at all glandular. The evidence of its hybrid nature is found not only in the combination of these characteristics of *R. Lobii* with the small flowers of *R. divaricatum*, but especially in the flowers and the inflorescence. The relationship of these plants may be further indicated by the following analysis:

R. DIVARICATUM.

Flowers (ovary and calyx) 7-10 mm. long; in number 1-4, usually 2; peduncles smooth; pedicels smooth, longer than the bracts; ovary smooth; style hirsute; calyx-tube greenish, smooth; sepals dark purple, smooth; petals fan-shaped; anthers green.

R. LOBBII.

Flowers (ovary and calyx), 14-20 mm. long; in number 1-4, usually 1 or 2; peduncles glandular-pubescent; pedicels glandular-pubescent, shorter than the bracts; ovary glandular; style smooth; calyx-tube dark red, pubescent; sepals dark red, pubescent; petals wedge-shaped; anthers purple.

R. DIVARICATUM X R. LOBBII.

Flowers (ovary and calyx) 8-10 mm. long; in number usually 3, (D); peduncles smooth or nearly so, (D); pedicels smooth or nearly so, longer than the bracts, (D); ovary grandular, (L); style hirsute, (D); calyx-tube greenish, nearly smooth, (D); sepals dark red, pubescent, (L); petals wedge-shaped, (L); anthers green, (D).

(D and L indicate that the characteristics are those of *R. divaricatum* and *R. Lobbii* respectively.)

While this evidence is fairly conclusive, one cannot affirm with certainty that the plant is a hybrid until the character of its progeny is known. At Ucluelet the plant does not set fruit. At Victoria it fruited abundantly, the claret-colored berries being somewhat intermediate in hue between the dark red of *R. Lobbii* and the deep purple of *R. divaricatum*. Further, one hesitates to be dogmatic, since not only are *Ribes* hybrids produced with difficulty by the horticulturist, but natural hybrids of this genus are unknown in North America. This note is published pending further investigations in order that collectors on Vancouver Island and in the States of the Northern Pacific coast may be on the look-out for the plant.

A NEW CLIFF SWALLOW FROM CANADA.

BY HARRY C. OBERHOLSER.

The form of *Petrochelidon albifrons*[1] inhabiting most of western Canada proves to be subspecifically distinct from the typical race. It may be described as follows:

PETROCHELIDON ALBIFRONS HYPOPOLIA, subsp. nov.

Chars. subsp.—Similar to *Petrochelidon albifrons albifrons* from eastern United States and Colorado, but larger; frontal band paler, more whitish; breast more grayish (less ochraceous).

Description.—Type, adult male, No. 195055, U. S. Nat. Mus., Biological Survey collection; Fort Norman, Mackenzie, June 11, 1904; E. A. Preble, original number, 1830. Forehead creamy white; crown metallic blue black; hind neck brownish gray; back and scapulars, like crown, but streaked with brownish gray and whitish; rump cinnamon; upper tail-coverts light fuscous, the tips of the feathers whitish; tail fuscous; wings fuscous black, with a slight metallic bluish or greenish sheen, the inner edges of the primaries and secondaries paler and on terminal portion narrowly edged with brownish white, the outer webs of the inner secondaries and of the tertials margined with the same, and the greater wing-coverts slightly tipped with paler brown; lores and narial bristles, brownish black; sides of the head below the eyes, together with the upper throat, between chestnut and bay; chin and centre of the lower throat, black; sides of neck light brownish gray; breast, sides, and flanks, light brownish gray, the centre of the breast washed with pale cinnamon; remainder of the lower parts dull white, the crissum washed with chestnut; lining of wing light brownish gray; edge of wing barred with dull light cinnamon and brownish gray.

Measurements.—Male:[2] wing, 110-115 (average, 112.1) mm.; tail, 49-52 (50.7); exposed culmen, 6-8 (7.2); tarsus, 11-13 (12.3); middle toe without claw, 10.5-12 (11.3).

Female: wing, 108-111.5 (average, 110.2) mm.; tail, 49.5-51.5 (50.7); exposed culmen, 6-8-7.2 (7.0); tarsus, 13; middle toe without claw, 12-12.5 (12.3).

Geographic distribution.—Breeds in northwestern North America, north to Mackenzie and central Alaska; west to central British Columbia; south to Montana; and east to Alberta and Mackenzie. Migrates through Wyoming and California. Winters probably in South America.

This is the largest of the races of *Petrochelidon albifrons*, and differs from *Petrochelidon albifrons tachina* still more than from the typical *Petrochelidon albifrons albifrons*. The difference in measurements between *Petrochelidon albifrons albifrons* and our new Canadian race may be seen by comparison of the figures above given for the latter with the following dimensions of *Petrochelidon albifrons albifrons* taken from Colorado, Wyoming, and eastern United States birds.

Male:[3] wing, 105-112 (average, 107.6) mm.; tail, 47-51 (49.9); exposed culmen, 7-8 (7.2); tarsus, 12-13 (12.6); middle toe without claw, 11-12 (11.8).

Female:[4] wing, 102-109 (average, 107.2) mm.; tail, 47-51 (48.9); exposed culmen, 7-8 (7.4); tarsus, 11.5-13 (12.5); middle toe without claw, 11-13 (11.9).

Breeding birds from Dickey in southern Idaho, the Snake River in eastern Washington, and from Ashcroft in central southern British Columbia, are apparently referable to *Petrochelidon albifrons albifrons*. Specimens from Greybull and Saratoga, Wyoming, are in size about half-way between *Petrochelidon albifrons albifrons* and *Petrochelidon albifrons hypopolia*, but in color they are decidedly nearer the former, and are here included under that race. A single specimen from Pembina, North Dakota, indicates that the bird from at least the northeastern part of North Dakota is the eastern form. The present new race migrates through the western United States, as spring examples from Wyoming and southern California indicate.

All the specimens of *Petrochelidon albifrons hypopolia* examined are included in the following list:

Alaska. Nulato (May 24, 1867); St. Paul Island (about June 10, 1918).

Arizona. Tucson (April 18, 1918).

Mackenzie. Fort Resolution (June 23, —); Fort Good Hope (June 20, 1904); Fort Norman (June 11, 12, and 14, 1904).

California. Laguna Station, San Diego County (May 4, 1894).

Montana. Milk River at 49° north latitude (July 25, 1874); Johnson Lake (June 3, 1910); Fort Benton.

Wyoming. Ten Sleep (May 31, 1910).

[1] For the change of name from Petrochelidon lunifrons to to Petrochelidon albifrons, cf. Rhoades, Auk, XXIX, No. 2, April, 1912, pp. 193-195.

[2] Five specimens, from Alaska, Mackenzie, and Montana.

[3] Seven specimens.

[4] Eleven specimens.

THE CLIMATIC INTERPRETATION OF TWO EARLY ORDOVICIAN MUD-CRACK HORIZONS.*

BY E. M. KINDLE.

A mud-crack horizon which has not been previously reported occurs in the Grenville section on the Ottawa river. This horizon which is exposed on the north bank of the river immediately above the Canadian Northern railroad bridge is in the upper part of the Beekmantown formation. Its relationship to the associated beds is indicated in the section below which was studied by the writer in company with Dr. M. E. Wilson.

Section above C.N.R. bridge at Hawkesbury.

a. Sandstone with coarse sand and fine gravel in upper part and fine sand in lower. Numerous vertical worm tube impressions (Base of Chazy) ---------- 2′

b. Thin bedded limey shale (top of Beekmantown) ---------- 2′

c. Dark grey fine grained limestone with botryoidal fracture ---------- 8′

d. Coarse textured grey limestone full of small fossils ---------- 1′6″

e. Thin bedded shaly limestone ---------- 3′

f. Heavy bedded grey limestone and covered 10′

g. Thin bedded grey argillaceous and magnesian limestone with mud-crack throughout the upper 4′ Resembles sandstone when weathered ---------- 6′

Between *a* and *b* of this section there is probably a disconformity. All of the Ottawa valley sections show a rather abrupt change in lithology at this horizon. The change in fauna is equally marked.

The very sharp and clearly defined character of the fossil mud-crack in bed *g* of this section is its most noteworthy feature. The mud-crack polygons exhibit a rather unusual and significant feature in their upturned margins. Many examples of this mud-crack show the unwarped margins of the polygons rising above the centre as much as ¼ inch. Associated with these is a surface structure suggesting raindrop impressions.

It has been shown experimentally[1] that this type of mud-crack results from the dessication of fresh water mud and that flat or slightly downwarped polygons develop from saline mud. Since mud-crack with upwarped margins is produced only in fresh or brackish water muds we must conclude that this mud-crack horizon represents intertidal mud-flats which were covered at high tide by relatively fresh waters comparable perhaps with those of the upper Baltic sea. The reappearance of a marine fauna in the section a few feet above the mud-crack horizon appears to indicate the return of normal marine conditions. The relatively fresh or slightly brackish water conditions under which these mud-cracks were formed point toward their development in lagoons near a shore which contributed an abundance of river water to partially land-locked arms of the sea. Such a land must have had a moist climate or at least not an arid one.

Another mud-crack horizon occurs about 100 feet higher in the Ontario Ordovician section at Kingston in the Pamelia limestone. Cushing[2] has reported this horizon in New York and the writer has described its peculiar features at Kingston.[3] Attention is directed to it here because it suggests climatic conditions near the close of Pamelia sedimentation just the opposite of those indicated by the Grenville mud-crack. The flat polygons of the Pamelia mud-crack horizon show features which have been interpreted[4] as the product of a highly saline condition of the calcareous mud in which they were developed. Sea water would be likely to develop the high degree of salinity represented by the Kingston mud-crack only in an arid climate.

It seems therefore that a relatively arid climate prevailed during late Pamelia time in the lands adjacent to the Ontario sea. This arid climate succeeded a cycle of moist climate in late Chazy time if the inference which has been drawn from the character of the mud-crack is correct.

*Published with the permission of the Director of the Canadian Geological Survey.

[1]Kindle, E. M. Some factors affecting the development of mud-cracks Journ. Geol., vol. 25, 1917, pp. 140-142.
Separation of salt and saline water and mud. Bull. Geol. Soc. Amer., vol. 29, pp. 479-483, 1918.

[2]Bull. N.Y. State Mus. Nat. Hist. No. 145, p. 76. 1917, pp. 135-144.

[3]The Ordovician Limestones of the Kingston Area. Rept. of the Ontario Bureau of Mines, vol. 25, pt. 3, p. 8, 1916.

[4]Kindle, E. M. Some factors affecting the development of mud-cracks. Journ. Geol., vol. 25, 1917, pp. 140-142.

BOTRYCHIUM OBLIQUUM MUHL., AND VAR. DISSECTUM (SPRENG.) NEW TO THE PROVINCE OF QUEBEC.

By H. Mousley, Hatley, Que.

It has been said in one of the handbooks on ferns that if you begin your search for them in March you will hardly be rewarded by finding any but the evergreen species, and even these are not likely to be especially conspicuous at this season. If this is so, what excuse I am going to make for searching for them in December I hardly know except that my enthusiasm for all natural history pursuits knows no bounds ,and refuses to be curbed by conventional ideas. I search almost as eagerly for rare Warblers' nests late in the fall as I do in the summer, and having just taken up the study of ferns I was anxious to see whether it was not possible even in the depths of winter to locate and name quite a number by means of their dead and dried fruiting fronds. Now I do not wish to pose as a kind of super-human person, for had not nature in the present instance come to my aid in the shape of a very rapid thaw during the second week in December, I am afraid this paper would never have appeared in print, nor would I have obtained very many evidences of the existence of even dead fruiting fronds ,as most of these in the natural order of things would have been buried under a heavy coating of snow, which in these parts is generally in evidence (more or less) for seven months out of the twelve.

However, this winter (1918-19) has been particularly kind and from December 15 to 23 (owing to the afore-mentioned thaw) the fields were practically clear of snow, and the woods had comparatively little in them as compared with other years. This state of things made it possible, therefore, to indulge in winter fern hunting, and for a week I spent a good deal of my time in visiting spots where I had previously noticed some of the large Osmundas, Onocleas and others, whose fruiting fronds are so very different from the sterile ones, and which as a rule can generally be found even in winter, when there is hardly a vestige of the latter left. During the above week I found the following species and varieties, viz: Maiden hair *(Adiantum pedatum)*, Common Brake or Bracken *(Pteris aquilina)*, Silvery Speenwort *(Asplenium acrostichoides)*, Christmas Fern *(Polystrichum acrostichoides)*, Marsh Fern *(Aspidium thelypteris)*, Crested Shield Fern *(Aspidium cristatum)*, Clinton's Wood Fern *(Aspidium cristatum* var. *Clintonianum)*, Boott's Shield Fern *(Aspidium Boottii)*, Spinulose Wood Fern *(Aspidium spinulosum* var. *intermedium)*, Hay-scented Fern *(Dicksonia punctilobula)*, Sensitive Fern *(Onoclea sensibilis,)* Ostrich Fern *(Onoclea struthiopteris)*, Royal Fern *(Osmunda regalis)*, Interrupted Fern *(Osmunda claytoniana)*, and last but by no means least the Ternate Grape Fern *(Botrychium obliquum)*, and the var. *dissectum*, both of which form the title of this paper.

Little did I think when I set out on the morning of December 21, that I was going to add an additional species and variety to the list of Quebec ferns, yet such was the case, as Mr. J. M. Macoun tells me that there are no records at Ottawa of the two ever having been found in the province before, nor are there any examples in the Herbarium of the Geological Survey from this section of Canada.

Of *B. obliquum*, however, there are examples from two localities in Nova Scotia, and from several around Niagara Falls, whilst of the var. *dissectum* some are from New Brunswick, and some from localities also around Niagara Falls. In Gray's Manual, 7th edition, p. 49, there are several illustrations of the varieties of *B. obliquum*, including one of the var. *dissectum*, and seeing that the species is polymorphous there are no doubt many others yet to be found, so that it is altogether quite an interesting plant and one well worth looking for. As a matter of fact neither of my examples are quite typical, and do not agree exactly either with those from Nova Scotia, New Brunswick or Niagara Falls.

I only found one example of each in a very sheltered spot under a cedar tree on the outskirts of a large wood about two miles to the south of Hatley village ,this wood forming part of the farm originally known as the Poole farm, but now belonging to Mr. Will Hunter. The specimens were quite fresh and green when found, and after having been duly pressed and preserved they were subsequently presented to the Herbarium at Ottawa. Of the var. *dissectum*, Gray in his Manual says: "Often found with the typical form in New England," and so I found it here, the two not being more than twelve inches apart from one another, which fact I imagine is all in favor of *dissectum* being pronounced a variety of *B. obliquum* and not a separate species as some are still inclined to consider it I believe.

In conclusion I may say that besides the species already enumerated I had previously found the following additional ones, viz: Long Beech Fern *(Phegopteris polypodioides)*, and Oak Fern *(Phegopteris dryopteris)*, these two bringing my list up to a total of eighteen, which may be considered very satisfactory, I think, for the amount of time so far spent on the subject.

NOTES AND OBSERVATIONS.

REMARKS ON THE METAMORPHOSIS OF THE SCALLOP *(Pecten tenuicostatus)*.—After hatching, the young scallops attach themselves to rocks, scallop shells, or other objects to which they remain as fixtures for a year or two. I can tell this from numerous young specimens obtained which possess an aperture through which a portion of the creature protrudes for attachment, and from a few specimens I came across which possess an elastic byssus for attachment, which protrudes from the so-called foot, and also from the margins of growth, the striations, and other points of structure which undergo a modification.

In the earlier stages the byssal attachment appears to agree with that of *Anomia* throughout the life-history of that genus; that is, there is an aperture near the apex of the under valve through which a portion of the mollusk itself protrudes, so that it is directly attached to the object. But its agreement with *Anomia* in this respect is only temporary, for in time the scallop develops a byssus which is of elastic constituency, such as the mussel *(Mytilus)* possesses throughout its life-history. In the instance of the scallop again this provision is only temporary, for in time as it continues to grow the byssus disappears, and the scallop is free and can then move about by the flapping of its valves.

Sometimes I was able to determine a stage of development from a single example. For instance, the fact that at one time in its life-history the scallop develops an elastic byssus secreted from the foot for attachment to an external object. This I know from only one specimen which had such a byssus. Two other specimens of the same character were obtained, but the byssus of one of them had been broken off in the raking, and it was found lying loose, and the other, a much smaller one, was also detached from the object.

Considering that the byssus always occurs on the same side of the scallop, and that the aperture of the more immature form extends to the margin of the valve, it is evident that the elastic elongation simply evolves from the original attachment, and that the aperture of the under valve as it becomes obliterated, leaves the scallop, except that it is now moored to an external object, otherwise free.

Judging from an illustration from Parker and Haswell, these zoologists seem to regard the pectens as hermaphrodite, as they show one part of the gonad in the same individual as male and the other as female. But this is not so, at least in the case of the scallop. The sexes are distinct, and out of 209 scallops specially examined by me in my observational work, 100 were males, 108 females, and in one the sex was indeterminable. The gonad of this last mentioned was completely empty, not that I consider the scallop had spawned, for it was impoverished generally, and apparently in a sickly condition. I might have been able, had I known it at the time, to determine the sex by the digestive organs, but this was a later discovery. This fact, however, helps to emphasize what I say as to the sexes being distinct. The gonad of the male is cream-colored and the stomach and its appendages gray, whereas the gonad of the female is a sort of brick-red color and the stomach and its appendages brown.

ANDREW HALKETT.

A ROBIN'S MISTAKE.—A pair of robins have for some years been in the habit of building their nest among the creepers which grow on the side of my house, having for neighbors a pair of crow blackbirds. This year the two nests were placed on either side of a bay window, only a couple of yards apart. Both young families left the nest at about the same time, and this circumstance evidently led to complications. The parent crow blackbirds showed no lack of interest in their young family. On the contrary, for the first day or two after the latter left the nest the old birds resented the appearance of anyone on the lawn where the young were, complaining loudly and making savage darts at the intruder, as though intending to do him grevious bodily harm. Nevertheless, in spite of all this parental solicitude, one of the young crow blackbirds was adopted by one of the parent robins. How it originally came about I do not know; but a few days later, when all of the other members of both familes had disappeared, I was attracted by the novel sight of the robin working industriously early and late to satisfy the voracious appetite of his adopted progeny, who followed him about continually demanding more. This proceeding continued for about three weeks and as the pair remained all that time in my garden, I was able to keep close watch on them and to note the gradual growth of the young blackbird, until when I last saw them he was fully plumed and almost indistinguishable from an adult. There was, therefore, no doubt whatever as to the correctness of the identification. It was not, as some might be inclined to suggest, a cow bird, but unquestionably a crow blackbird. Once, on the second or third day of my observations a pair of adult crow blackbirds—possibly the real parents—arrived on the scene and for a time evinced considerable excitement over their "lost heir," but as the latter took

no notice of them whatever, but stuck to the robin and as he, poor bird, was much too busy hunting worms to notice anything else, the blackbirds presently calmed down and flew away, no doubt concluding that it must be a case of mistaken identity.

Has any reader of THE FIELD-NATURALIST ever heard of such a curious mix-up as this? It is, I suppose, just possible that the explanation may be that a crow blackbird's egg was laid in the robin's nest. The nest was so situated close to the glass of a window that one could look into it quite easily from one of the rooms of my house. Nevertheless I did not examine it until the eggs were hatched, and then only very cursorally. It is, therefore, possible, though I think unlikely, that the young crow blackbird was in the nest and escaped my notice. Naturally I was not expecting that any question would arise as to the identity of the young robins. Still I think the more likely explanation to be that by some curious chance the robin accidentally adopted one of his neighbor's children soon after the two families had simultaneously left their respective nests.

W. L. SCOTT.

Tredinnock, Ottawa.

BOOK NOTICES AND REVIEWS.

THE BIRDS OF MIDDLE AND NORTH AMERICA. By Robt. Ridgway, Part VIII, Continuation of Bulletin 50, U.S. National Museum, Washington, Government Printing Office, 1919.

The monumental task of monographing all the birds of North and Middle America was begun by this veteran ornithologist, now probably the Dean of the science in America, many years ago. The first volume covering the Finches and Sparrows appeared in October, 1901. Since then the following parts have appeared. The contents covering Canadian species only is given here.

Part II, 1902, The Tanagers, Troupials (blackbird and orioles) and Wood Warblers.

Part III, 1904, Pipits, Swallows, Waxwings, Vireos, Shrikes, Crows and Jays; Titmice, Nuthatches, Creepers, Wrens, and Dippers.

Part IV, 1907, Thrushes, Mockingbirds, Starlings, Larks and Tyrant Flycatchers.

Part V, 1911, Hummingbirds and Swifts.

Part VI, 1914, Woodpeckers, Kingfishers, Goatsuckers, and the Barn and Eared Owls.

Part VII, 1916, Cuckoos and Pigeons.

This present volume now appearing includes Oyster-catchers, Turnstones, Surf Birds, Plovers, Snipes, Phalaropes, Avocets, Skimmers, Terns, Gulls, Skuas and Auks.

The next Part, namely IX, now in course of preparation, will contain Cranes, Rails, Gallinules and Coots; Turkeys, American Partridge, Grouse, Falcons, Hawks and Eagles and American Vultures.

It is contemplated that Part X will complete the work.

The magnitude of this work can be partially appreciated by the fact that each volume runs from 550 to 875 closely printed pages, many of them consisting of masses of abbreviated bibliographical references and synonomy requiring immense research and exact transcription and proofreading. Dr. Elliott Coues said that bibliography required the work of an "inspired idiot." On these grounds alone the Birds of Middle and North America would be notable, but as each species and subspecies is accompanied by the fullest detailed description and each has been subjected to the strictest scrutiny as to taxonomic standing and relationship by one of the keenest observers in America it is evident that this will stand as a monument to the author for many years. It will be noted that the classification does not follow that of the A.O.U. Check list and is not familiar to the majority of American ornithologists. In this it probably shows a considerable step in advance. The latter is acknowledged to be faulty, but it has not been thought expedient to change it until a system can be presented that wlli meet a more general approval than any hitherto advanced receives. The work is not popular, but confines itself to strictly scientific aspects of taxonomy, nomenclature, identification and distribution. The purely popular nature student has little interest in it except as a reservoir of ascertained facts to guide, control and direct his esthetic impressions and investigations.

P. A. TAVERNER.

HAMILTON M. LAING. Whilst it is not the custom to treat newspapers as serious scientific publications it seems that some attention should be called to the series of excellent articles on popular ornithology appearing more or less regularly in the Toronto *Globe*. These are from the pen of Hamilton M. Laing, who is taking the place of the late lamented Sam Woods who conducted this nature column with but scanty recognition for a long period. Mr. Laing is a Canadian, of considerable experience in Manitoba, now resident in Portland, Oregon. During the latter days of the war he was in the aviation corps and assisted in training many of our fliers who later made a good account of themselves at the front.

The subject of these papers cover such a range of subjects as "The Shore Birds in Autumn,"

"Hawks Everyone Should Know," "The Wood Warblers," etc. The subjects are treated in a popular, entertaining manner, in a style that more than occasionally warrants the term "fine writing", sympathetically but with an absence of gush and with a good substratum of personal knowledge and common sense. We can stand many more of such popular science writers in Canada as well as elsewhere. P. A. TAVERNER.

In the *Auk* for April, 1919, appears the following titles of especial interest to Canadians:

WINTER ROBINS IN NOVA SCOTIA, by Harrison F. Lewis, pp. 205-217. This records the unusual appearance of robins in widely separated localities of Nova Scotia, in late December, January, February and early March. The interesting point brought out is that the number of robins increased during the season of greatest cold, culminating in early February in weather below zero and disappearing when the temperature moderated. It is suggested that these winter visitors are not unseasonably early migrants from the south, but a collection of winter lingerers from the north or interior gathered together by the unusual inclement weather.

PROBLEMS SUGGESTED BY NESTS OF WABBLERS OF THE GENUS *Dendroica*, by John Tredwell Nichols, pp. 225-228, raises some interesting questions as to the nest-building instinct and the facility or otherwise with which birds substitute new materials of civilization for their ancestral supplies.

ON THE POPULAR NAMES OF BIRDS, by Ernest Thompson Seton, pp. 229-235, is a plea for more characteristic common names for birds, advocating terms of spontaneous and natural origin over those of more clumsy manufacture.

THE REALITY OF SPECIES, by Leverett Mills Loomis, pp. 235-237. This is a short paper discussing the subspecies question. The conclusion of the author (quite in harmony with the ideas of this reviewer) is that whilst the species with its component races is a reality, the lesser subspecific subdivision is but a concept.

GEOGRAPHICAL VARIATIONS IN THE BLACK-THROATED LOONS, by A. C. Bent, pp. 238-242. This is a brief discussion of the occurrence of these allied species in America. The writer lumps four forms *Gavia arctica*, the Black-throated Loon, *G. pacifica*, the Pacific Loon, *G. viridigularis*, the lately described Green-throated Loon, and *G. suschkini*, the Asiatic form, in one species as geographical races of *G. arctica*. *Pacifica* appears to be the common North American form with *viridigularis* of erratic occurrence on the Pacific coast. He questions the specific, even the subspecific distinction of this form as he can limit it to no geographical range. It does not appear that true *G. a. arctica*, in spite of repeated records to the contrary, has even been satisfactorily recorded from America.

REASONS FOR DISCARDING A PROPOSED RACE OF THE GLAUCUS GULL *(Larus hyperboreus)* by Johnathan Dwight, pp. 242-248. In this paper Dr. Dwight brings his keen analytical pen to bear on H. C. Oberholser's proposal *(Auk*, 1918, p. 472) to recognize the rejected northwestern American form *Larus barrovianus* as a subspecies of the Glaucus Gull. By a series of graphic diagrams he shows that the size distinctions upon which the form is based are too variable for recognition, further driving his argument home by superimposed outlines of the average bills of the two supposed races in which the distinction of size is shown to be absurdly small. In conclusion, he says:

"In our gropings after the truth it is wasteful of too much time to spend so much of it stumbling over names of groups so poorly defined that they convey only a vague meaning to a few specialists and none at all to everybody else. Decking the subspecies in all the glittering panoply of diagnosis, dimensions and distribution makes it an impressive spectacle, but this does not necessarily make of it a good subspecies."

These are sentiments of which the reviewer heartily approves.

THE BIRDS OF RED DEER RIVER, by P. A. Taverner, pp. 248-265. This is the last half of a paper begun in a previous number. Including an addenda it brings the number of species annotated to 194.

FOURTH ANNUAL LIST OF PROPOSED CHANGES IN THE A. O. U. CHECK LIST OF NORTH AMERICAN BIRDS by Harry C. Oberholser, pp. 266-273. In this are gathered together all the various proposals of the past year that may affect American Ornithological nomenclature. It deals with about seventy-two names. Without doubt some of these will be accepted according to the canons of our Code of Nomenclature, but it is a matter of some congratulation to us that this lengthy list is one of mere proposal and not accepted fact. These late lists of proposals show that the genus splitter is in full action. It is to be hoped that the committee on nomenclature will bear in mind that the genera is but a conception adopted for convenience and that it defeats its own end when each genus approaches the monospecific and in place of simplifying our system but adds to its complexity.

Under General Notes, Harry C. Oberholser, pp. 282-283, in Status of the Generic Name *Archibuteo* decides that *Archibuteo* is a *nomen nudum* and therefore untenable and that the next name applicable for the genus of the Rough-legged Hawks is

Triorchis Kaup. This would change the accepted name of both our Roughlegs.

In the Division of Correspondence, P. A. Taverner writes urging that caution be used in identifying birds subspecifically by either geography or slight characters alone advocating, except where the case is clear or indisputable, that the specific binomial be used leaving subspecific status open until such times as more evidence is available. This is replied to by Witmer Stone, the editor, with a qualified assent, but advancing a negative argument that the present reviewer (the author of the original letter) regards as dodging the question.

Information of peculiar interest to us is the report upon the J. H. Fleming, Toronto, Ontario, collection of birds, on page 321, which is also copied by the *Ibis* for July. It reads:

"This is one of the largest private collections and covers the birds of the entire world—a most commendable feature. We learn that it comprises about 25,000 specimens representing 5,377 species and 1,925 genera, as recognized in Sharpe's Hand List.' When we note that there are, according to this authority, some 17,000 species of birds and 2,647 genera, we realize that Mr. Fleming has about one-third of the known species and three-fourths of the genera represented, the latter being evidence of the painstaking care that he has exercised in bringing together this notable series of specimens."

This is one of the really notable private collections in English-speaking America; in some directions, as in the thoroughness with which it covers its broad field, equalling or even outranking those of the larger American museums.

The gathering of this monumental series has been results of a life time and if the future Canadian student of ornithology in its broader aspects, finds the working tools for his investigations within this Dominion it will be entirely due to Mr. Fleming's efforts.

This is by far the largest collection of birds in Canada, outranking even in mere point of numbers its nearest rival, that of the Museum of the Geological Survey at Ottawa, representing the Dominion Government's national collections, which though practically confined to the Canadian field, numbers barely 14,000 specimens. Whilst these figures may seem large to the unitiated they are really small in comparison with the more notable collections abroad. There are a number of private collections in the United States ranging in the neighborhood of 60,000. The collection of the United States National Museum, a comparable institution to ours, has, exclusive of large collections of the Biological Survey which are practically amalgamated with it, reached 200,000, whilst the British Museum bird collections passed the half-million milestone ten years ago. These comparative figures are merely given here to indicate that while Canada may be congratulated on having made a healthy start in this branch of scientific investigation, she has still a long way to go before she can compete on a par with other countries which have had a longer start in the field of zoological research.

P. A .TAVERNER.

WILD ANIMALS OF GLACIER NATIONAL PARK. *The Mammals*, with notes on Physiography and Life Zones, by Vernon Bailey, Chief Field Naturalist, Bureau of Biological Survey, Department of Agriculture. *The Birds*, by Florence Merriam Bailey, author of Handbook of Birds of the Western United States. Dept. of the Interior, Franklin K. Lane, Secretary. National Park Service, Stephen T. Mather, Director. Washington: Government Printing Office, 1918. (Pp. 1-210, with 21 halftone plates of mammals and 16 of birds, 18 text figures of mammals, and 78 of birds. Copies may be procured from the Superintendent of Documents, Government Printing Office, Washington, D.C., at 50 cents per copy).

Glacier National Park lies in northwestern Montana, along the main range of the Rocky Mountains, the "Continental Divide," from the Canadian boundary, where it adjoins one of our own Canadian national parks, the Waterton Lakes Park, on the north, to the line of the Great Northern Railway on the south. Glacier Park, though one of the more recently established United States parks, is rapidly becoming famous as a region of great scenic beauty, celebrated by painters and photographic artists. The present volume is a praiseworthy effort of the United States park management, during the recent turning of the movement of vacation tourists to "See America First," resulting in many new visitors to the national parks, to set forth some of the less known natural advantages of these great national playgrounds to a large and constantly growing class of people. The scenic mountain-peaks, icy glaciers, and mirroring lakes scarcely need to be pointed out, but other fascinating possibilities are not so obvious. Interest in wild life is growing everywhere, and nothing adds to the interest of our parks more than glimpses of animated life. A few squirrels or sprightly chipmunks obviously add a touch of life even to a city park, and a sight of the picturesque and rapidly disappearing large game animals of the Rockies in their native habitat is worth going far to see. Soon the parks may be the only place where we shall have this privilege.

Glacier Park has a wonderful natural variety of plants and animals, containing within its boundaries areas ranging from the lower Transition Zone of its open plains borders, through the dense forests of lodgepole pine, spruce and fir in the Canadian Zone at the base of the mountains, the narrow belt of dwarfted timber at or near timberline in the Hudsonian Zone, and the Arctic-Alpine Zone of the higher mountain-tops. Mr. Bailey has sketched briefly the botanical wealth of these varied climatic and life zones, but the book deals mainly with mammals and birds, and no one is better qualified to treat them than Mr. Bailey with his lifetime of experience in field work in the West, accompanied on many trips by the accomplished "bird woman" who is his wife. While the book is of aid to every beginning naturalist or enquiring tourist who may visit the region, it will prove useful as a Baedeker for the most expert, telling him where the species he is most interested in may be found at the proper time. A good assortment of interesting life-history notes on each species is given, with suggestions of many things which may be of value for succeeding visitors to the park to watch for and add to our knowledge. Most of the mammals are illustrated by photographs from life. The bird section is well illustrated by new life photographs from various sources, and well-selected reproductions of photographs, sketches, and paintings which have been used in other publications. A systematic key is given for the classification of the commoner summer birds of the park which will be useful in other places in the northern Rockies.

In addition to the pleasure and profit which this book gives to a person already interested in natural history, and its value as a strictly biological report, its chief value will probably lie in introducing the fascinating possibilities of wild life study to the average citizen, the casual tourist and park visitor, whose numbers are increasing from year to year. When this interest is developed, and the parks need only be entered and intelligent attention called to their advantages for the interest to be kindled, a new force is added to the protection of wild life, rational conservation, and public recreation, the influence of which can not be overestimated.

The Canadian National Parks offer similar if not greater possibilities. Waterton Lakes Park (just north of Glacier Park), Rocky Mountains Park at Banff, Jasper Park in Alberta, Point Pelee Park in Ontario (the most southerly point in Canada, on the great migratory bird route along the shore of Lake Erie) and the Percé and Bonaventure reservation for the protection of the great seabird rookeries at the tip of the Gaspé peninsula of Quebec, have their own peculiar attractions to the nature lover, and are bound to be still more attractive when their wild life attractions are more generally known to the public. For such areas, the little books which teach the eye to know what it sees, as well as to notice what is often hidden to the unseeing eye, have an increasing function in popular education.

R. M. ANDERSON.

(The October Number was mailed on November 18, 1919.)

THE CANADIAN FIELD-NATURALIST

VOL. XXXIII. DECEMBER, 1919. No. 6.

CHAMPLAIN'S ASTROLABE.

By Charles Macnamara, Arnprior, Ontario.

The astrolabe was an instrument for measuring the altitude and relative positions of heavenly bodies. It was probably invented by those eminent astronomers of antiquity, the Chaldeans; at any rate it was well known to the Greeks and Orientals long before Christ. Essentially it consisted of a graduated circle, across the diameter of which was a moveable bar, pivoted at the centre. In use the instrument was hung plumb, and the body whose altitude it was desired to ascertain, was sighted along the bar, the angle above the horizon being read on a scale at the edge of the circle. The name of the instrument, derived from the Greek, may be translated as "star-taker."

The astrolabe gradually developed into two different types: a large stationary spherical apparatus that was the chief instrument in observatories even into the 17th century, and a small circular model that could be conveniently carried by travellers. This portable type was often richly ornamented, and engraved with elaborate graduations and scales, but about 1480 a simple form was designed for the use of mariners, and it was apparently this model that Columbus used on his voyages of discovery. It proved, however, an awkward instrument on a pitching vessel, and shipmen generally seem to have preferred another device known as the cross-staff. Nevertheless, the astrolabe continued in use until well into the 18th century, when it was displaced by the quadrant.

In 1867 an astrolabe was found near Cobden, Ontario, on the old portage route which cuts off the great elbow that the Ottawa river makes to the north between its expanses known as Allumette lake and Lac des Chats; and as first noticed by the late A. J. Russell of Ottawa, in a pamphlet published in 1879, evidence points strongly to the instrument having been lost by Champlain on his journey up the Ottawa in 1613, more than 250 years before.

Champlain was induced to undertake this expedition by the lying story of one Nicholas de Vignau, whom he had entrusted with some minor explorations in Canada, and who had spent a winter with the natives there. On de Vignau's return to France in 1612, he told Champlain a wonderful tale of how he had reached the North Sea by way of the River of the Algonquins—otherwise, the Ottawa. One could travel, de Vignau said, from the Falls of St. Louis (Lachine) to this sea and back again in 17 days; and he amplified his story by asserting that he had seen the wreck of an English ship on the shore, and that the Indians there could show the scalps of the crew of 80 men that they had killed, sparing only one English boy whom they were keeping for Champlain.

Deceived by this fabrication—to which de Vignau actually made affidavit before two notaries at La Rochelle—Champlain, on Monday, the 27th May, 1613, to the sound of a parting salute from his ships, set out with five companions from Isle Ste. Hélène (opposite the present city of Montreal) to seek the mythical sea. The party travelled in two canoes, and at starting consisted of Champlain, de Vignau and three other Frenchmen with one Indian; but later on one of the Frenchmen was sent back and a second Indian took his place.

A saying of the late Mr. Lindsay Russell, one time Surveyor General of Canada, was that "a multiplicity of apparatus is the hall-mark of the amateur." Champlain was an old experienced traveller, to whom voyages of discovery had become so much a matter of course that his journals never make any particular mention of his equipment, and we may be sure that he carried no "multiplicity of apparatus." But he certainly must have been provided with an astrolabe, for at three different places along his route he took observations for latitude. The first was near the foot of Lake St. Louis on the St. Lawrence, the position of which he gives as 45° 18′. Considering the crudeness of his instrument, his observation was remarkably accurate, for the correct latitude is about 45° 25′.

In these days of swift and luxurious travel, it is interesting to note that it took the explorer eight days to cover the distance between Montreal and Ottawa; and that on the way he was nearly drowned in the Long Sault rapids. Thus, he reached the Chaudière Falls on the 4th of

June, and after determining the latitude of the portage on the Hull side as 45° 38′ (actually 45° 26′) he proceeded up Lake Deschênes the same day. The barren Eardley hills on the one side and the sandy shores of Constant Bay on the other gave him a poor opinion of the surrounding country, and he puts it down as "very unpromising." The party passed the night "on a very pleasant island"—doubtless Mohr island—and on the 5th June they portaged at the Chats falls and paddled up Lac des Chats. Champlain speaks of the Madawaska river as a tributary at this point, but says nothing of the Mississippi or the Bonnechère. His remark that "the lands about the before-mentioned lake are sandy" shows that he must have gone up by the Quebec shore, and was struck by the long arid stretches of Kilroy's bay and Norway bay. In Lac des Chats they camped as usual on an island, evidently for safety, as the Algonquins were always desperately afraid of a surprise attack by the Iroquois. On this island Champlain recounts that he "saw a number of fine red cypress [cedars] the first I had seen in this country, out of which I made a cross, which I planted at one end of the island on an elevated and conspicuous spot, with the arms of France, as I had done in other places where we had stopped. I called this island Sainte Croix." Red cedar has been extinct for many years on Lac des Chats, and there is no island in the lake with any marked elevation on it, so it is impossible to identify Holy Cross island with any certainty; but probably it is one of the Braeside islands, or perhaps the island opposite Norway bay.

Next day, Thursday, 6th June, they ascended the Chenaux rapids to within about a mile of the present village of Portage du Fort, and landed on the Ontario side at a point known in after years as Gould's Landing. Champlain took the latitude of this place and says he found it 46° 40′. In reality the place is about 45° 34′; and in some way he had made a mistake of a degree in his calculation. "Here," Champlain says, "our savages left the sacks containing their provisions and their less necessary articles in order to be lighter for going over-land and avoiding several falls which it was necessary to pass." And here de Vignau, who must have been contemplating the approaching exposure of his falsehood with ever increasing anxiety, tried to persuade Champlain that the best route was up the Ottawa, his hope, evident in the sequel, being that the long succession of rapids above Portage du Fort would bring disaster on the expedition, or at least discourage Champlain and cause him to turn back. But "our savages said to him, you are tired of living, and to me that I ought not to believe him, and that he did not tell the truth." Convinced that the Indians knew the best way, Champlain took their advice, and the party climbed to the higher land above the river, and travelled southward a couple of miles to the first of a chain of long narrow lakes that lie across the base of the large peninsula formed by the great swing of the Ottawa river towards the north. Until railways extended into this part of Ontario in the seventies of the last century, the route here followed by Champlain was still the principal road to the upper Ottawa. Steamboats plied on Lac des Chats from the head of the Chats rapids to Gould's Landing, and thence travellers were conveyed by stage to Muskrat lake where they embarked on a steamboat that carried them to within a few miles of Pembroke.

This was the longest and hardest portage the expedition had struck yet. Champlain himself carried three arquebuses and three paddles, his cloak and "some small articles," among which it is safe to say was the famous astrolabe. The others, he says "were somewhat more heavily loaded, but more troubled by the mosquitoes than by their loads." They passed through the string of four small lakes, the first three of which are known as Coldingham, Town and Catherine, the fourth being apparently nameless, and stopped for the night on the shore of the more important Olmsted lake.

"Nous nous reposasmes sur le bord d'vn estang qui estoit assez agreable, & fismes du feu pour chasser les mousquites, qui nous molestoient fort, l'importunite desquels est si estrange, qu'il est impossible d'en pouuoir faire la descriptio." Thus Champlain: If he returned to-day, he would see many and astounding changes in the country he discovered; but among all that was new and wonderful, he would again find in the month of June the same old mosquitoes, the importunity of which is as extraordinary as ever.

In the morning (Friday, June 7th), they paddled down Olmsted lake, and on foot crossed the three miles or so of country that separates it from Muskrat lake, as the connecting streams are not navigable even by a bark canoe. A small lake about a mile long, now called by the popular name of Green lake, lay in their way, and although Champlain does not mention it, it is very likely that the Indians were glad to take advantage of even such a short piece of water as this in their long portage. It was on the right bank of the small stream flowing out of Green lake, and some 200 yards from the foot of the lake, that the astrolabe was found. Somewhere between Olmsted lake and Muskrat lake, Champlain and his men encountered what foresters know as a windfall. The thick growth of pines had been blown down by a tornado, and it was with great difficulty that the party made their way

"now over now under these trees." The ways in which the astrolabe may have been lost are of course numberless, but there is at least a strong probability that this windfall occurred around Green lake, and that in climbing through the confusion of trees, the instrument was dropped unnoticed in the tangle.

Near Muskrat lake they found a settlement of Indians who received them kindly, and fitted out two canoes to convey them on their way. From the foot of the lake they portaged once more, this time to the Ottawa, where they were met by the Chief Tessouat, and with him crossed to Allumette island. Protected by the long portages and numerous rapids, the Algonquins, feeling comparatively safe from the dread Iroquois, had established here a considerable village of wigwams and were cultivating the somewhat sterile soil. Neither the site of this village nor the extensive cemetery nearby, described at length by Champlain, has ever been discovered. A rich find awaits some lucky archeologist on Allumette island.

For our present purpose it is important to notice what Champlain says about the latitude of this place. The text of the 1632 edition of his journal reads: "Elle est par les 47 degrez." In "Voyages of Samuel de Champlain," edited by W. L. Grant (New York, 1907), the translator, missing the point of this expression, renders it simply as: "It is in latitude 47°." The real meaning of the phrase is perhaps best expressed in colloquial form: "It is somewhere around 47 degrees." Champlain says nothing of the loss of his astrolabe, but it is clear that he made no observation here—presumably be-



Champlain's Astrolabe; actual size is 5⅝ in. in diameter. From photograph kindly supplied by Mr. Samuel V. Hoffman.

cause he was without the means—and merely estimated the position by dead reckoning from his last observation at Gould's Landing.

And now the fatal hour for de Vignau had come. His story of the North Sea seems to have been suggested by some vague report he had heard of English explorations in Hudson's Bay. But he knew nothing about Hudson's Bay, and in order to give his imaginary sea a local habitation and a name, he connected it with Lake Nipissing, which he had no doubt heard spoken of by his Indian hosts as a large body of water not many days' journey distant. Thus Champlain was led to ask Tessouat raised loud cries, and Tessouat said: "You are a downright liar, you know well that you slept at my side every night with my children; if you were among the people mentioned it was while sleeping."

For a while the impostor brazened it out, but at last gave in and made full confession. "After meditating by himself he fell on his knees, and asked my pardon, declaring that all he had said both in France and in this country in respect to the sea in question was false, that he had never seen it, and that he had never gone farther than the village of Tessouat." His anxiety to return to Canada, he said, had caused him to concoct the story—Cana-



Green lake, near Cobden, Ont.; outlet flows through rushes at lower right-hand corner.

for canoes and men to visit the "Nebicerine" (Nipissings).

At first agreeing very reluctantly—for they were not on good terms with the Nipissings—at a later council the Indians decided that the road was too hard and dangerous, and refused to go. To overcome these objections, Champlain pointed to de Vignau as a young man who had travelled to the Nipissings without encountering such great difficulties or finding the people so unfriendly. Astonished, Tessouat asked: "Nicholas, is it true that you say you were among the Nebicerine?" It was long before de Vignau answered; then he said hesitatingly: "Yes, I was there." At this the Indians dians will forgive him a little for the implied compliment to their country—and he trusted to the hardships and hindrances of the road to turn Champlain back before the lie was discovered.

The Indians were greatly pleased that de Vignau's avowals had vindicated them, but they tried to wreak vengeance on the wretched liar. "Give him to us, and we promise you that he shall not lie any more," they cried, and all set after him shouting—"their children shouting still more." But Champlain, to clear himself of the failure of the expedition, desired to have the impostor repeat his confession before the Frenchmen at the ships, and so he saved de Vignau from the wrath of the savages.

Regretting the waste of time and the hardships endured to no purpose, but patient under his disappointment, Champlain started on his return journey on the 10th June, accompanied by forty canoes, which number was later increased to eighty by accession of parties along the way, all eager to trade their furs at the Falls of St. Louis for the wonderful wares of the white man. Champlain did not recross the Muskrat lake portage, but ran the rapids down the main stream. At the Chaudière the Indians threw an offering of tobacco into the falls with appropriate ceremony, "by which means they are ensured protection against their enemies, that otherwise misfortune would befall them." But in his heart, man has seldom any real faith in a propitiatory sacrifice—the gods are not so easy to turn aside—and in spite of this solemn rite, several times the Indians were thrown into a panic at night by false alarms of an Iroquois attack.

Arrived at the ships on the 17th June, Champlain called his chief men together, and had de Vignau "make declaration of his maliciousness" before them. The wretch pleaded hard for forgiveness, "and in view of certain considerations" Champlain pardoned him. The subsequent fate of the impostor is not on record. The French would have nothing to do with him, and Champlain says: "As for our liar, none of the savages wanted him, notwithstanding my request to them to take him, and we left him to the mercy of God." And so de Vignau disappears from history.

Anyway his troubles were all over when our story begins again after an interval of 254 years. From 1613 we jump to 1867, in which year John Lee, a farmer living in the Township of Ross, near Cobden, Ontario, took a job of clearing land for Captain Overman, of the *Jason Gould*, the Ottawa Forwarding Company's steamboat on Muskrat lake. Captain Overman had located lot 12 in the second concession of Ross, about two miles from the town of Cobden; and it was here that the astrolabe we must attribute to Champlain, was found in August, 1867, by John Lee's son, Edward George, at that time a boy of 14 years, and now a well known resident of the third line of Fitzroy, a few miles from Arnprior. How he discovered the astrolabe cannot be better told than in Mr. Lee's own words, as he related it to me in August last:



Stream from Green lake flows through alders on the right. Astrolabe was found near where figure is standing.

"One day we were working just below Green lake in a bush of mixed hardwood and pine. I don't remember the number of the lot now, but it was afterwards occupied by John Sammon, father

of Mr. Sammon, of the Copeland House, Pembroke. When noon came, pa sent me home for his dinner, and when I got back with it he sat down to eat it, while I went on drawing the logs with our team of oxen, Buck and Brin, to the heaps where they were being burned. We burned timber those times that would make a man's fortune now-a-days. There was an old fallen red pine that lay downhill with its top in the little creek that comes out of Green lake. Pa had chopped the trunk of this tree into three logs, and I drew two of them away with the oxen, but the third log, just below the branches was not chopped clean off, and I hitched the oxen to it and pulled it around sideways so as to break it off. I had to dig away the moss and marl that the old tree lay in so as to get the chain around the log, and when the log swung around it rolled back the moss like a blanket, and there on the ground I saw a round yellow thing, nine or ten inches across, with figures on it, and an arm across it, pointed at one end and blunt at he other. Alongside of it was a lump of rust that might have been chains or something like that, but I did not pick it up. I showed the compass to pa, and he put it on a stump a little way up the hill. Just then Captain Roverman (sic) came along to see how the work was going, and old Captain Cowley was with him. Pa showed them the compass and they took it away, and pa said they promised to give me $10.00 for it, but I never got a farthing nor saw hide or hair of the compass since. Poor pa let them have it, but if I had got it up to the house, ma would not have give it to them that easy. The compass was lying about two or three rods from the edge of the creek. I never saw water enough in creek to float a canoe."

Considering that it was more than fifty years since Mr. Lee had found the astrolabe and that he had never seen it or any reproduction of it since, his description of the instrument, while not quite correct, is remarkably close to the reality, and does great credit to his memory, as well as giving his story the undoubted stamp of truth. It will be noticed that as a plain man making no pretence to book learning, Mr. Lee never ventures on the name "astrolabe," but always speaks of the instrument as a "compass." Sometimes in conversation, with a real feeling for style, to avoid iteration, he refers to it as "the item."

Captain Overman eventually gave the astrolabe to Mr. R. W. Cassels, of Toronto, president of the Ottawa Forwarding Company, but this priceless relic of the founder of Canada was so lightly appreciated by Canadians that it was permitted to leave the country, and in 1901 an American connoisseur, Mr. Samuel V. Hoffman, of New York, added it to his large collection of astrolabes. It is still in Mr. Hoffman's possession, and to him I am much indebted for the photograph of it illustrating this article.

In comparison with the exquisitely finished instruments of precision carried by the modern explorer, Champlain's astrolabe is a very rough production. A careful description of it is given by Russell in his pamphlet already referred to. The instrument, which has the date 1603 engraved on it near the bottom, is of brass, and is of 5⅝ inches diameter. The metal is ⅛ inch thick at the top and increases to ⅜ inch at the bottom, the extra weight below being intended to give steadiness in use. A ring at the bottom, to which, Russell surmises, a weight was to be hung for additional stability on shipboard, was accidently broken off before the astrolabe came into Mr. Hoffman's hands. The suspension ring at the top has a double hinge to ensure the instrument hanging plumb. (The fine statute of Champlain in Major's Hill Park, Ottawa, shows the great explorer holding his astrolabe upright in his hand, but this is an artistic license; in making an observation, the instrument was held suspended from the top.) The circle is divided into single degrees, and it was possible, as Champlain's observations prove, to determine latitude by aid of the instrument to within 15 minutes of a degree or even less.

Last October under Mr. Lee's guidance, I visited the place where the astrolabe was picked up. Lee had not been there for many years, yet he had no difficulty in finding the place, and the surroundings agreed accurately with the description he had given me two months before. Naturally, tremendous changes have taken place in the 300 years since Champlain and his men, heavily laden, "et plus greuez de mousquites que de leur charge," forced their way through the primeval woods. The sombre pine forest that then rolled unbroken over the ridges and valleys has long disappeared, and the somewhat hilly land is now laid out in well cultivated farms with clumps of hardwood bush here and there. Hardwoods grow to the water's edge around Green lake, except at its foot, where there are some old farm buildings, and a large sloping field, along the bottom of which the small stream that issues from the lake flows through alders and poplars. It was on the right bank of this "creek" a few yards from the water, and about 200 yards below the lake, that Lee found the astrolabe in the moss. There is no prominent object in the landscape to mark the exact spot, and where the instrument lay is now cultivated ground. But

to fix the position as nearly as may be, it should be noted that the slope of the field becomes a little steeper just here and forms a slight shoulder, and the stream begins a small deviation towards the south. The stream is not nearly large enough to navigate a canoe, and there is nothing to show that it was ever any larger. But its valley leads in an approximately direct line to Muskrat lake, and there is no doubt that Champlain and his party portaged along it both for the guidance of the flowing water and because it was their shortest road.

In the preparation of this article I have to thank Mr. A. F. Hunter, secretary of the Ontario Historical Society, for bibliographical references and other assistance; and I am also under obligation to Mr. L. P. Sylvain, of the Library of Parliament, Ottawa, for ready permission to consult the Government's rare Canadiana.

BIRDS OF NORTHERN SASKATCHEWAN AND NORTHERN MANITOBA COLLECTED IN 1914 BY CAPT. ANGUS BUCHANAN.

By J. H. Fleming.

Almost the first knowledge we have of the ornithology of the Saskatchewan region is contained in a series of papers published in the *Ibis* of 1861-62-63, by Capt. Blaikston, who spent the winter of 1857-58 at Fort Carlton, on the Saskatchewan river, and in 1858 collected at various points in what is now the Province of Saskatchewan. In these papers Capt. Blakiston incorporated much information from Vol. II of the Fauna Boreali-Americana of Richardson and Swainson, and other published sources. Since then our knowledge of the birds of southern Saskatchewan has been constantly enlarged, but strangely enough the ornithology of the great region drained by the Churchill river and lying to the north of what was till 1912 the northern boundary of the province, has had little or no attention paid to it. Notes on its birds were made by James M. Macoun, who in 1888 travelled from Lesser Slave lake east by way of the Athabasca and Churchill rivers to Lake Winnipeg; these notes were eventually published by John Macoun in his "Catalogue of Canadian Birds." Less than a dozen birds are in the U.S. National Museum collected at Du Brochet lake in 1890, and Pelican Narrows in the Churchill river in 1891; probably collected by Henry MacKay, and Joseph Hourston for Roderick MacFarlane; these are the only skins I have seen from this region taken before 1914. During the years 1892-93-94, J. Burr Tyrrell in the course of his explorations of the Barren Grounds more than once traversed the Churchill river, and his official reports[1] contain the best description we have of this region; in these reports there are short references to birds. When Edward A. Preble wrote his great report on the Natural History of the Athabasca-Mackenzie region[2] he included all that was known of the birds of the Churchill river up to 1908.

When the boundaries of Saskatchewan were, in 1912, extended north to include a part of the old Northwest Territory, so little was known by the Provincial Government of the natural history of the northern part of the country that Angus Buchanan determined to investigate the country lying between the Saskatchewan river and the Barren Grounds. He left Prince Albert on May 6, 1914, and descended the Beaver river to Lake Ile-à-la-Crosse, and the Churchill river, thence continuing upstream on Reindeer river, and Reindeer lake, entering the Cochrane river on July 18, and Lake Du Brochet on August 1. His base camp was made north of this lake, and here he proposed to winter, but hearing of the outbreak of the war in late October, he dedecided to return, reaching Regina on January 15, 1915, after an absence of eight and a half months, during which he travelled nearly two thousand miles by canoe and dog-sleigh. The birds collected during this expedition were divided, part were deposited in the Provincial Museum at Regina, and the rest handed over to me; they form a very important addition to our knowledge of the birds of the region drained by the Churchill river, and are in fact the first collection made in northern Saskatchewan.

After making a short report[3] of his trip, to the Provincial Museum at Regina, Mr. Buchanan returned to his home in Scotland, enlisted in the Legion of Frontiersmen (25th Royal Fusiliers) as a private, was sent to East Africa, and served throughout that campaign, rising to the rank of captain, and received the Military Cross, and on being invalided home requested me to prepare a list of the birds collected in 1914. I had already examined the birds in the Museum at Regina in 1915

[1] Annual Report, Geological Survey of Canada VIII (new series) Part D, pp. 5D to 120D, Ottawa, 1896. Ibid., IX, 1896, Part F (1897).

[2] A Biological Investigation of the Athabasca-Mackenzie Region. North American Fauna No. 27. Bureau of Biological Survey, Washington, 1908.

[3] Report of the Chief Game Guardian, 1914, pp. 33-34, 37-39, Regina, 1915

and I am indebted to Mr. H. H. Mitchell, of the Provincial Museum, Regina, for the loan of any that were needed for comparison. The data on the birds themselves is exceedingly full, and Capt. Buchanan has furnished me with a list of the specimens together with notes on the colors of the soft parts, food, etc., from this I have quoted when necessary, but except in three instances have not used the sight records, which will be given fully in a forthcoming book by Capt. Buchanan.

Colymbus holboelli, Holboell's Grebe.

Set of five eggs taken on Churchill river, June 6; bird seen at close range.

Gavia immer, Loon, Great Northern Diver.

An adult taken on Reindeer lake, July 8.

Larus brachyrhynchus, Short-billed Gull.

An adult female taken on Reindeer lake, July 9; one more seen on same date; this is very far east for this gull. "Iris, clear blackish-grey; edge of eyelid surrounding eye, deep orange chrome; corners of mouth, pure orange chrome; feet, pale whitish-yellow." Dr. Oberholser regards this gull as a subspecies of *Larus canus*.[4]

Larus delawarensis, Ring-billed Gull.

A male taken on Ile-à-la-Crosse lake, May 23; adult except for the black primaries and terminal black band of the tail, probably a non-breeding bird. "Bill, medium dark greenish-yellow, with strong black ring around bill a short distance from tip; eyelids, and corners of mouth, deep orange-chrome; feet, pale greenish-yellow." Seventeen others seen with this bird.

Larus philadelphia, Bonaparte's Gull.

Four specimens, one adult male (thought by the collector to be a non-breeding bird), taken on the Cochrane river, July 20. "Iris dark; bill black; legs and feet, orange-chrome." One adult female, taken on Cochrane river, July 25, "Iris dark; eye-ring, dark crimson; bill, black; corners of mouth, reddish-flesh color; legs whitish orange-chrome; feet, more rich chrome." Two juvenile birds taken on Lake Du Brochet, Cochrane river, August 1, one of these, a female, is marked "Iris, dark; bill, medium dull blackish-grey; both mandibles dark from nostril out; legs, feet, and webs, whitish skin color with pale brown joints." This species is believed to breed in trees, and it is unfortunate in view of the young birds taken, that the nesting site was not found.

Xema sabini, Sabine's Gull.

Three seen and a pair of adults taken on Sandy lake, Churchill river, June 9; the female is marked "Iris, black; pure red eye-ring; bill, black to one-eighth beyond nostril, remainder of tip medium dull lemon yellow; feet, black."

[4]Auk, XXXVI, 1919, pp. 83-84.

Sterna hirundo, Common Tern.

A juvenile female with primaries not fully grown, taken on Cochrane river, August 14. Seen in company with parents and another young bird.

Mergus americanus, Merganser.

A male in very worn immature plumage, taken on the Churchill river, June 1. "Iris, dark; bill, medium deep crimson, crown of upper mandible, black; feet, bright orange-chrome."

Mergus serrator, Red-breasted Merganser.

An adult female taken on Lake Ile-à-la-Crosse, May 23. "Iris, clear deep umber brown; bill, all red except along crown of upper mandible which is dark horn-brown; legs and feet, rich reddish orange-chrome."

A downy young female, length 14.75 in., taken on the Cochrane river, August 15. "Iris, pale clear brownish sage-green; bill, blackish-brown over crown of upper mandible for entire length, except tip, sides of upper mandible and entire lower mandible pale dull buffish yellow; legs and feet, dull brownish-grey; webs, dull umber-brown. Bird in company with mother and about a dozen young."

Set of twelve eggs taken on rocky island in Reindeer lake, July 12. "Nest, found on ground concealed beneath ledge of rock; eggs almost hard on rock and rim of nest composed of small leaves and twigs profusely mixed with blackish-grey down."

Nettion carolinense, Green-winged Teal.

A pair taken on the Beaver river, May 18.

Oidemia perspicillata, Surf Scoter.

Three specimens, one adult male, taken at Lake Ile-à-la-Crosse, May 31; two adult females taken on the Reindeer river, June 30. "Flock of about twelve scoters together, all in pairs."

Phalaropus fulicarius, Red Phalarope.

A male taken on Sandy Fly lake, Churchill river, June 11.

Steganopus tricolor, Wilson's Phalarope.

Two specimens, an adult female taken on Crooked lake, May 13. "Bird alone, resting as if tired out, perhaps migrating." The other an adult male taken on the Beaver river, May 19. "Male and female together on floating weeds, on edge of small lake off Beaver river; birds in company with pair of Dowitchers and Lesser Yellow-legs."

Gallinago delicata, Wilson's Snipe.

Nest taken near Lake Ile-à-la-Crosse, May 31. "Four eggs, slightly incubated, nest of damp grasses on ground among low snow-berry bushes. Flushed bird off nest three or four times to-day and yesterday."

Macrorhamphus griseus griseus, Dowitcher.

Five specimens, a pair taken on Crooked lake, May 13, have been compared with a series of this form and of *M. g. scalopaceus*. Another pair

taken on the Beaver river, May 19, and a male on Lake Ile-à-la-Crosse, May 23.

Pisobia fuscicollis, White-rumped Sandpiper.

A female taken on Sandy lake, Churchill river, June 10, and a male taken on Sand Fly lake, Churchill river, June 11.

Pisobia bairdi, Baird's Sandpiper.

Four specimens, a female taken near Fort Du Brochet, Reindeer lake, July 17; and a male and two females taken on the Cochrane river, July 23.

Pisobia minutilla, Least Sandpiper.

Four specimens, a female, Reindeer lake, July 13. "Bird alone breeding on island, apparently had nest." A female taken July 29, and a pair taken on the Cochrane river, July 30.

Pelidna alpina sakhalina, Red-backed Sandpiper.

A female, Churchill river, June 8. "Shot on small stony island, in company with seven Semipalmated Sandpipers."

Ereunetes pusillus, Semipalmated Sandpiper.

Two pairs taken on the Churchill river, June 2, from a flock.

Calidris leucophaea, Sanderling.

Three specimens taken from a flock of four, Cochrane river, July 21; "probably non-breeding birds."

Helodromus solitarius solitarius, Solitary Sandpiper.

"A female with large egg in oviduct;" Beaver river, May 18.

Actitis macularia, Spotted Sandpiper.

Two adults ,a male, Crooked river, May 15, and a female, Lake Ile-à-la-Crosse, May 23. Two sets of four eggs each, taken on the Churchill river, June 10 and 13, also a downy young taken on the Cochrane river, July 29.

Charadrius dominicus dominicus, American Golden Plover.

An adult female taken when in company with Killdeer Plover, on the Churchill river, June 2. "Eye, bill, and feet black."

Oxeyechus vociferus, Killdeer.

Seen in company with the Golden Plover, but no specimens taken.

Aegialitis semipalmata, Semipalmated Plover.

Four specimens, a male, Lake Ile-à-la-Crosse, May 23; a pair, Cochrane river, July 23, and a female taken July 29, also on the Cochrane river.

Arenaria interpres morinella, Ruddy Turnstone.

Four specimens, a female found alone on Lake Ile-à-la-Crosse, on May 22; a male also found alone on the same lake on the 23rd; and two females taken from large flock on June 9, on the Churchill river.

Canachites canadensis canadensis, Hudsonian Spruce Partridge.

Eight specimens, six adults and two downy young. A pair with nest and eggs taken at Lake Ile-à-la-Crosse, May 25; male not preserved. "Eggs, six in number, fresh; nest on ground close in at foot of alder bush; site, dry open poplar knoll, surrounded by dense spruce and tamarack swamp; nest of dry leaves, same as carpet of surrounding ground, a few feathers lining nest." A male, same locality, May 29. A female in moult, and a downy young, Reindeer lake, July 10, the female has pin feathers on the sides of the head, and new tail feathers are appearing. A downy young, Cochrane river, July 20, was with other young and female parent when taken. A male taken August 3, a female, August 4, and a male, August 7, all adults, Lake Du Brochet. The young could fly, though the first was only five inches in length.

Lagopus lagopus lagopus, Willow Ptarmigan.

One specimen, Fort Du Brochet, Reindeer lake, November 4. "Same day first Barren Land Caribou of the season were shot."

Accipiter velox, Sharp-shinned Hawk.

An adult male, Otter lake, Churchill river, June 20.

Astur atricapillus atricapillus, American Goshawk.

A female, and set of three eggs, Beaver river, May 16.

Buteo platypterus, Broad-winged Hawk.

Three specimens, a melanotic male, Crooked river, May 14, is chocolate brown except for the tail bars, which are normal; a male taken in same locality on the 15th, and a female taken on Beaver river, May 16.

Haliaectus leucocephalus alascanus, Northern Bald Eagle.

An adult male, taken on the Churchill river, June 12; three downy young taken on Reindeer lake, two on the 7th and one on the 10th of July. These latter are marked, "Iris, dark umber brown; bill, dark horn color; cere, slightly more light brown, corner of mouth, pale whitish-yellow; legs and feet, whitish-yellow."

Falco columbarius columbarius, Pigeon Hawk.

Seven specimens, an adult female (two other birds seen), Reindeer lake, July 13; a female in company with four or five almost fully fledged young, three of which were taken, Lake Du Brochet, August 3; the young have wings and tail not fully grown and traces of down on the head; the old bird is in very worn plumage with one fresh blue tail feather, but showing no other signs of the blue plumage. Two fully fledged young birds (two others seen), Lake Du Brochet, August 7.

Pandion haliaëtus carolinensis, American Osprey.

Three specimens, a female, Crooked lake, May 13; a male, taken with nest, Lake Ile-à-la-Crosse, May 25. "Nest containing single egg on very top

of broken-off dead jack pine; nest mainly built of twigs, inside thickly lined with damp mud, grass and moss; fish scales on edge of nest; the male bird was bringing both talons full of damp moss to nest when shot." A female taken with nest and two eggs, Churchill river, June 6.

Surnia ulula caparoch, American Hawk Owl.

A male taken on Lake Du Brochet, August 1.

Picoides arcticus, Arctic Three-toed Woodpecker.

An adult male, Cochrane river, July 13; yellow crest, much worn, exposing the white bases of the feathers.

Picoides americanus fasciatus, Alaskan Three-toed Woodpecker.

An adult female, Fort Du Brochet, October 22.

Sphyrapicus varius varius, Yellow-bellied Sapsucker.

Two males, Big river, May 7 and 11.

Colaptes auritus borealis, Boreal Flicker.

One female, Cochrane river, July 21; the male seen. There is another adult female in the United States National Museum taken at Lake Du Brochet, September 26, 1890. This form is included in the range of *luteus* in the A.O.U. Check List.

Sayornis phoebe, Phoebe.

A male, Reindeer river, June 30.

Nuttallornis borealis, Olive-sided Flycatcher.

Two males, Lake Ile-à-la-Crosse, May 27 and 28.

Empidonax trailli alnorum, Alder Flycatcher

Three specimens, a male, Churchill river, June 6; two from the Cochrane river, July 27 and 28, the latter a female. All taken in willows at edge of marsh.

Empidonax minimus, Least Flycatcher.

A female, Lake Ile-à-la-Crosse, May 29, and a male, Reindeer river, June 28.

Perisoreus canadensis canadensis, Canada Jay.

One immature bird, Reindeer lake, July 11, is somewhat difficult to place; it compares well with one of about the same age from 40 miles southwest of Calgary, Alberta, August 4, 1895; and is not so dark above as a younger bird from near Latchford, Ontario, June 10, 1906. Preble refers to a breeding bird from Pelican Narrows, Churchill river, in the United States National Museum,[5] and in fact Reindeer lake is well within the known range of *canadensis*.

Corvus corax principalis, Northern Raven.

Five specimens; three from Churchill river; a young bird taken from the nest, June 2; an adult female, June 18, and a young bird fledged and in company with parent and two other young; two adult males taken December 15, one on Lake Du Brochet, the other on Reindeer lake.

[5]North American Fauna No. 27, 1908, p. 402.

Corvus brachyrhynchos subsp? American Crow.

An immature female taken on the Reindeer river, June 29; this bird compares well with a breeding female from Craven, Saskatchewan, much better than it does with Ontario birds, and may better be placed with the Western Crow, *C. b. hesperis*, but owing to lack of material of comparable age I hesitate to do so.

Euphagus carolinus, Rusty Blackbird.

Three specimens from Lake Du Brochet, August 7, an adult male, "Iris, clear yellowish-white," an immature (female?) "Iris, medium clear umber brown;" and an immature male, "Iris, pale sage green."

Carpodacus purpureus purpureus, Purple Finch.

Two adult males, Big river, May 9; a female seen with these.

Acanthis linaria linaria, Redpoll.

Three specimens, an adult male with rosy breast, Cochrane river, July 21, "Bird in company with one young; bill, dark brownish." Two males, an adult and young, Lake Du Brochet, August 10; "bill, flat black" in the young.

Plectrophenax nivalis nivalis, Snow Bunting.

One specimen, Reindeer lake, October 23. "Large flocks of these birds for the past fortnight."

Passerculus sandwichensis subsp? Savannah Sparrow.

Three specimens, one from Lake Ile-à-la-Crosse, May 27; an adult male from Fort Du Brochet, July 17; and a juvenile female, Cochrane river, July 28. These are very dark birds, much more so than *alaudinus* should be, and very different from the light race that breeds in southern Saskatchewan which is, no doubt, *nevadensis*.

Passerberbulus lecontei, Leconte's Sparrow.

Two specimens, one of a pair, Churchill river, June 2; a male, Haultaine river, June 6. "Birds breeding here."

Zonotrichia querula, Harris's Sparrow.

Seven specimens, an adult female, and a juvenile male, Cochrane river, July 26; an adult male, Cochrane river, July 30. "Male and female with fledged young." A female and young bird, Cochrane river, July 31; a female, Cochrane river, August 3. "Bird in company with others, probably her fully fledged young." An adult female, Lake Du Brochet, August 6. Adult's "bill, dull senna brown," juvenile's, "bill blackish-brown, yellow along edges of mandibles and at corners of mouth." So little is known of the early plumages of this sparrow that a description of the young of July 31, may not be out of place: length 3.75 in., pileum with feathers brownish-black, indistinctly edged with grayish-buff, producting a dark crown with a few grayish-buff spots ;throat and chin grayish-buff, throat with a

few blackish-brown spots; chest brownish-buff streaked with brownish-black; flanks buff with brown streaks, rest of under parts buffy-white; above brown streaked with black, upper tail coverts brownish-buff ta,il darker than in adult; wing coverts tipped with buff.

Zonatrichia leucophrys gambelii, Gambel's Sparrow.

Three specimens, an adult male and a juvenile male, Reindeer lake, July 16; and a young male, Cochrane river, July 26.

Spizella monticola monticola, Tree Sparrow.

A male, Reindeer lake, July 11. "Two pairs breeding on an island, first seen on trip." A female, Fort Du Brochet, July 17. "Bird had young almost fully fledged."

Spizella passerina passerina, Chipping Sparrow.

A male, Lake Ile-à-la-Crosse, May 27.

Melospiza melodia melodia, Song Sparrow.

A pair, Reindeer river, June 28.

Melospiza lincolni lincolni, Lincoln's Sparrow.

A male, Reindeer river, June 29.

Melospiza georgiana, Swamp Sparrow.

A male, Churchill river, June 6. "Small colony of these birds breeding at this place."

Passerella iliaca iliaca, Fox Sparrow.

Four specimens, all males, one Reindeer lake, July 11; three, Cochrane river, July 18 and 24, and August 3. The July 24 bird was carrying food to fledged young.

Petrochelidon lunifrons lunifrons, Cliff Swallow.

Two females, Churchill river, June 9; a pair, Cochrane river, August 6, fully fledged young in company with these last.

Iridoprocne bicolor, Tree Swallow.

Two specimens, a female, Crooked river, May 15; a young male, Lake Du Brochet, August 6. Two sets of eggs taken on the Churchill river, June 11; nests in old woodpecker holes in dead poplars.

Riparia riparia, Bank Swallow.

A male, Sandy lake, Churchill river, June 9.

Bombycilla garrula, Bohemian Waxwing.

Two specimens from Cochrane river, a juvenile male taken July 28. "Iris, dark, not reddish-brown, like adult." An adult female, July 30.

Bombycilla cedrorum, Cedar Waxwing.

A male, Key lake, June 25.

Lanius borealis, Northern Shrike.

A male, Cochrane river, October 19.

Vireosylva olivacea, Red-eyed Vireo.

A male, Dead lake, Churchill river, June 17.

Lanivireo solitarius solitarius, Blue-headed Vireo.

A male, Lake Ile-à-la-Crosse, May 28.

Mniotilta varia, Black and White Warbler.

A male, Beaver river, May 17.

Vermivora peregrina, Tennessee Warbler.

Three males, two from Lake Ile-à-la-Crosse, May 27, and June 2 ,one from Dead lake, Churchill river, June 17.

Dendroica aestiva aestiva, Yellow Warbler.

Two males, one Lake Ile-à-la-Crosse, May 27, the other Reindeer lake, July 4; this latter is only a little more worn than the May bird.

Dendroica coronata, Myrtle Warbler.

Three specimens, two adult males, from Big river, May 7 and 8; a juvenile, Cochrane river, July 27. Hoover's Warbler, *D. c. hooveri* has recently been revived by Dr. Oberholser and the range of this western race of the Myrtle Warbler is given as reaching east to central Mackenzie, but the adult taken May 8, which I have been able to compare with a series of both the supposed races; is nearer to *coronata*.

Dendroica striata, Black-poll Warbler.

A male, Beaver river, May 18.

Dendroica palmarum palmarum, Palm Warbler.

A male, Beaver river, May 18.

Seiurus noveboracensis noveboracensis, Water-Thrush.

Three specimens, a female, Beaver river, May 20; a male, Knee lake, Churchill river, June 6; and a female, Reindeer river, June 28. These are close to Grinnell's Water-Thrush, *S. n. notablis*, in color.

Wilsonia pusilla pusilla, Wilson's Warbler.

A male, Lake Ile-à-la-Crosse, May 26.

Sitta canadensis, Red-breasted Nuthatch.

A male, Lake Ile-à-la-Crosse, May 25.

Penthestes hudsonicus hudsonicus, Hudsonian Chickadee.

Three specimens, a pair taken at Big river, May 8; and a young bird, Cochrane river, July 24. This last is interesting though full-grown (length 5 in.), the pileum instead of being soft grayish-brown is blackish-brown, forming a distinct cap, while the hind neck and back are brownish-gray.

Regulus calendula calendula, Ruby-crowned Kinglet.

Three specimens, a male, Lake Ile-à-la-Crosse, May 28; a female taken with nest containing young, Churchill river, July 3; and a male taken, Reindeer lake, July 9. The nest taken July 3 is described as follows: "Nest in young spruce tree about ten feet high, nest against limb and about eight feet up. Nest contained seven young, about fourteen days old."

Hylocichla aliciae aliciae, Gray-cheeked Thrush.

Two males, Big river, May 11; Churchill river, June 18. This latter is in very worn plumage. "Bird in company with mate."

Hylocichla ustulata swainsoni, Olive-backed Thrush.

Two males, Ile-à-la-Crosse, May 25; and Black Bear island, Churchill river, June 14.

Hylocichla guttata pallasi, Hermit Thrush.

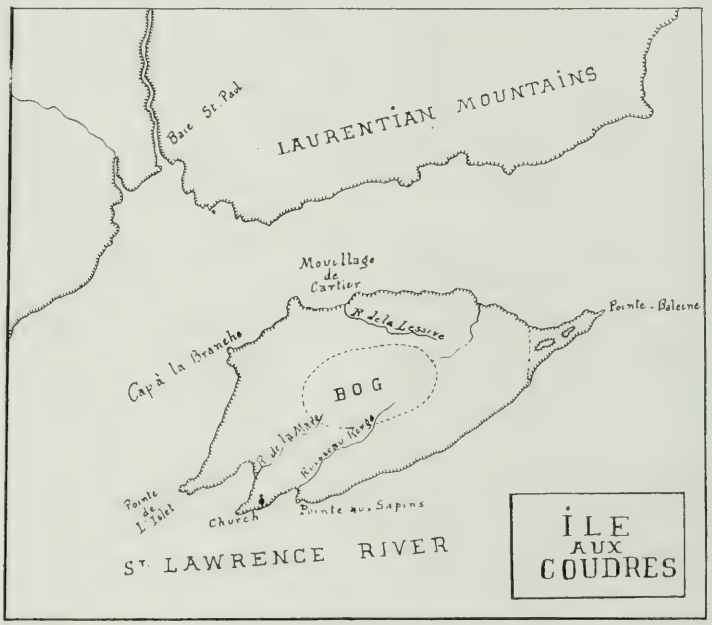
A male, Beaver river, May 18.

RANDOM BOTANICAL NOTES.

III. Isle-aux-Coudres, Que.

By Bro. M. Victorin, Longueuil College, Que.

For the purpose of furthering phytogeographical researches bearing upon the semi-halophytic section of the St. Lawrence river, and with the special aim of collecting specimens of *Carex* for monographical work, we alighted by noontide on June 22, 1917, on the Baie St. Paul wharf; our plant-press and other botanical outfit, though not imposing too much on the sturdy shoulders of the natives, nevertheless excited their curiosity to the utmost.



Like most of the members of the botanical fraternity, we have never succeeded in making clear to the average guide, driver or paddler, the point of view of the botanist. Notwithstanding this failure and through the good offices of François Bouchard, we crossed the channel and landed on Isle-aux-Coudres towards four o'clock. At the west end of the island, there is no other sort of wharf than François Bouchard's back, but this is as sure as a cantilever bridge. One who takes a strong hold about the fellow's neck crosses the wide expanse of mud and *Fucus* stretching at low tide between the water and the shore proper without injury to his boots.

A full week was spent visiting the island historically and botanically. We have given elsewhere[1] the impressions gathered from that quaint romantic spot which has preserved to an almost incredible degree, the language, customs and traditions of the 17th century and which, moreover, retains the most remarkable originality of not being spoiled by tourists. The following lines intend only to record briefly the botanical data collected.

Isle-aux-Coudres is of about fifteen miles' circumference and lies in the course of the St. Lawrence river about fifty miles below Quebec city. Though the inspection of a map would make one think that it belongs to the north shore, from which it is separated only by a relatively narrow channel, yet, like most—probably all—of the St. Lawrence islands it is on the southeastern side of Logan's fault, and is really a detached part of the south shore, showing the same inclined strata of shale and limestone as the near-by Cambrian Sillery of L'Islet. The whole island is an upland of from 50 to 100 feet elevation surrounded by a narrow alluvial

[1] Fr. Marie-Victorin, Croquis laurentiens: Isle-aux-Coudres. Le Parler Français, Vol. XVI, No. 1, pp. 161-171. 1917.

prairie. The centre is slightly depressed and occupied by an extensive bog which suggests that the place was, in geologically recent times, somewhat atoll-shaped. The river waters are decidedly fresh, less so at the lower end. The wave action—very powerful, save on the northern side sheltered by the high Laurentian cliffs of the mainland—has produced a noticeable bar of sand and gravel behind which has developed a continuous lagoon generally transformed into a marsh by the invasion of halophytes.

The leading plant in this particular habitat is the polymorphic *Carex acuta* L. (=*C. goodenoughii* J. Gay); the abundant rhizomes form a felted entanglement about as troublesome to farmers as the familiar couch grass. It is locally called "teigne," a very expressive word with the French Canadians, indicating something not easy to get rid of. Various sedges and flowering plants help *C. acuta* in filling the lagoons: *Carex recta* Boott, *Carex canescens* L., var. *disjuncta* Fernald, *C. Tuckermani* Dewey, *C. crinita* Lam., *C. maritima* Müell., *Caltha palustris* L., *Spathyema foetida* (L.), Raf., which occurs also in dry ground, *Menyanthes trifoliata* L., *Taraxacum officinale* Weber, var. *palustre* (Sm.) Blytt., *Cardamine pennsylvanica* Muhl., *Pedicularis palustris* L., *Sisyrinchium angustifolium* Mill., *Galium palustre* L., *Triglochim maritima* L. *Myosotis laxa* Lehm., and true *Viola cucullata* Ait., a name regarding which there has been some confusion in recent years.

No botanist would neglect a favorable opportunity to visit a northern bog. So, we started one fine morning with a party of barefooted youngsters roused to a high pitch of enthusiasm by trout prospects in the "Rouisseau Rouge." "Rouisseau Rouge," which derives its name from the dark color of the acid waters, is a brook discharging the bog waters into the St. Lawrence.

The Isle-aux-Coudres bog does not seem to differ materially from those of Rimouski and Temiscouata. As far as we have been able to see there is no free water in it. At this early season the water table was so high that we were able to inspect only the outer zone. With the usual *Kalmia augustifolia* L. *Kalmia polifolia* L. and *Ledum groenlandicum* Oeder, we were glad to see for the first time the fine flowers of *Rubus Chamaemorus* L. The amber-colored fruits are known everywhere in this district as "*blackbières*" an obvious corruption of the English word "blackberry." All those who have seen the ripe fruit of this plant will, no doubt, wonder at such a linguistic feat.

The genus *Carex* is always worthy of investigation in northern bogs. Here were found *C. trisperma* Dewey, a small form of *C. pauciflora* Lightf., and a new variety of *C. paupercula* Michx., which Mr. M. L. Fernald of the Gray Herbarium has recently described[2] as follows:

"*Carex paupercula* Michx., var. *brevisquama* n. var., squamis 3-4 mm. longis perigynium subaequantibus. Scales 3-4 mm. long, about equalling the perigynium. Quebec: Isle-aux-Coudres, Charlevoix Co., June, 1917, Bro. M. Victorin, No. 4021 (type in Gray Herbarium).

Remarkable for its very short scales which give the plants a distinctive aspect, the long-acuminate scales of typical *C. paupercula* being 5-8 mm., in length and much exceeding the perigynium. M. L. Fernald, Gray Herbarium."

The departure from the typical form is indeed striking and in the light of more abundant material might prove specific. The plant grew in a dense mass forming a small tussock.

Mr. M. L. Fernald had already made a detailed study of *C. paupercula* and its allies,[3] indicating clearly that the plant described by Michaux[4] is in reality a northern extreme of the *C. irrigua* of J. E. Smith.[5] Consequently, Michaux's name has priority. Furthermore, Michaux's plant, collected at Lake Mistassini has been shown to be of restricted boreal distribution, the species being represented southward by three distinct variations which may be summarized as follows:

CAREX PAUPERCULA AND ALLIES.

Pistillate spikes short-oblong, 4-10 mm. in length.
Pistillate scales 2-3 times as long as the perigynium.
1. *C. paupercula.*
Pistillate scales about equalling the perigynium.
2. *C. paupercula* var. *brevisquama.*
Pistillate spikes cylindric, 10-18 mm. in length.
Pistillate scales dark, castaneous; culms glabrous.
3. *C. paupercula* var. *irrigua.*
Pistillate scales green with brown border; culms scabrous.
4. *C. paupercula* var. *pallens.*

Carex paupercula Michx.—Northern Quebec; Lake Mistassini and the Shikshocks Mountains of Gaspé.

Carex paupercula Michx., var *brevisquama* Fernald—Quebec; known only from the type locality, Isle-aux-Coudres.

Carex paupercula Michx., var. *irrigua* (Wahlemb.) Fernald—Boreal and alpine Europe, subarctic regions and cold bogs of America: Quebec, Ontario, Nova Scotia, Massachusetts, Pennsylvania, Utah.

Carex paupercula Michx., var. *pallens* Fernald—Nova Scotia, Maine, New Hampshire, Massachu-

[2]Rhodora XX: 152, 1918.
[3]Rhodora VIII: 73, 1906
[4]Flora Boreali-Americana II: 172, 1803.
[5]Hoppe, Caric. Germ.: 72, 1826.

setts, Connecticut, New York, Michigan, Vermont, Minnesota, British Columbia, Ontario.

To finish with the sedges, we will mention *C. stipata* Muhl., *C. brunnescens* (Pers.) Poir., and *Carex angustior* Mackenzie found here and there on the island, giving a total of thirteen species met with—a rather small number.

In June very few grasses are suitable for collecting and only *Poa pratensis* L. and *Poa alsodes* Gray were gathered.

Among early-flowering genera, the often associated *Viola* and *Antennaria* hold an important place The collection of true *Viola cucullata* Ait. in damp ground has already been mentioned. In the woods outside the bog zone, *Viola renifolia* Gray, var. *Brainerdii* (Greene) Fernald, is abundant. On shaded ledges near the water, *Viola septentrionalis* Greene was growing profusely with the snow-white *Antennaria canadensis* Greene. No other *Antennaria*—not even the ubiquitous *A. neodioica*—was detected on the island.

Nobody who has read the history of this country can leave Isle-au-Coudres without paying a visit to Cap à La Branche where in the times of Wolfe, Nicette Dufour and François Savard captured the grandson of Admiral Durrell. Cap à La Branche is naturally but a low cliff covered with bushes and with a few white cedars which are supposed to have been Dufour and Savard's hiding-place—a snug one indeed. A brooklet runs down and supplies sufficient moisture to induce a gorgeous growth of *Saxifraga virginiensis* Michx. and *Draba arabisans* Michx.

At the Pointe-de-L'Islet, on exposed ledges facing the sea, the short grass was strewn with the innumerable white flowers of *Cerastium arvense* L., and the strict rose-tinted inflorescences of *Arabis brachycarpa* (T. and G.) Britton.

Close observers have already remarked that the older settlements in Quebec exhibit unusual floristic features which should be attributed to historical factors. The first settlers, the missionaries, the "Médecins du Roi," the nuns, were far from being *minus habens* and the gardens inside the palisade usually contained the best drug plants in favor at the time. When cultivation happened to cease on that particular spot, the plants had very often gained a strong foothold and were able to persist for centuries. A striking example of this is the abundance and persistance to date of *Serapias helleborine* L., on Mount Royal, Montreal Island, the only instance of an introduced orchidaceous plant that I know of.

On Isle-aux-Coudres we have observed an extraordinary abundance of Boraginaceae: *Echium vulgare* L., *Cynoglossum officinale* L., *Echinospermum Lappula* Lehmm., *Myosotis laxa* Lehm., *Lithospermum arvense* L. and others. The peculiarity can be noted about Quebec city and Mr. M. L. Fernald finds the same to be true of the old Gaspé settlements.

Hyoscyamus niger L. which we found rooted in the beach gravels on the southern side is evidently another introduction traceable to the drug-garden of early days. Singularly enough our field experience with this plant in Quebec has shown it to occur mainly on island beaches of historical fame: Ile des Soeurs (Chateauguay), Ile Sainte-Hélène (Montreal), Isle-aux-Coudres. Moreover, it has been noted that this weed introduced into New England by early settlers and recorded there as far back as 1672, has almost completely disappeared. It is a remarkable fact, adds Mr. M. L. Fernald,[6] that in Quebec, all along the St. Lawrence river, it is maintaining its own and its weed-character.

Tragopogon pratensis L. is common about buildings at Isle-aux-Coudres. It seems to be an introduction of the same class. The only other locality I know of in Quebec is about the base of Beloeil Mountain where it thrives in the old orchards.

Owing to the lack of sodium chloride in the surrounding waters the halophytes are few. *Fucus vesiculosus* L., however, is very abundant on the slanting rocks of the tidal shores, and is almost wholly relied upon as a fertilizer for potato fields. A scanty colony of *Cakile edentula* (Bigel) Hook., and a few bluish rosettes of *Mertensia maritima* (L.) S. F. Gray, were found among purpoise offal at the Pointe-de l'Islet.

We have as yet said nothing of the trees and shrubs; these have intentionally been kept for the end. The first thing a botanist is likely to look for when setting foot on Isle-aux-Coudres is the Hazelnut *(Corylus rostrata* Ait.*)* from which the place *(l'ysle ès Coudres* of Cartier) has derived its name. And yet, we have searched in vain for it all around. My friend, Jean-Bautiste Desgagné—a most important man, simultaneously farmer, postmaster, captain and sexton—informs me that he faintly remembers having seen one small bush in his youth but he is not sure! There is some difficulty to reconcile this fact with Jacques Cartier's assertion which runs thus: *et entre autres il y a plusieurs couldres franches fort chargées de noisilles aussi grosses et d'une meilleure saveur que les nôtres, mais un peu plus dures. Et par cela nommasmes ysle-es-couldres.*"[7]

Abbé Casgrain, presumably solely on Cartier's authority reasserts the same: "*Comme au temps*

[6]Fernald, M. L., Notes from the Phaenogamic Herbarium, I. Rhodora XII: 191, 1910.

[7]Cf. Brief récit et succincte narration, etc., of Cartier, 1545. Manuscript in the British Museum.

jadis, cette plage est encore pleine de beaux et grands arbres de plusieurs sortes, et il n'y a qu'à étendre la main pour cueuillir sur les couldres franches, les grappes de noissilles."[8]

Cartier's landing place, the so-called "Ruisseau à la lessive" is yet in its natural state, and it is very hard to believe that ecological conditions have changed enough in four centuries to expel the hazelnut from the island. Were it not for the express mentioning of the fruits, our opinion would be that Cartier was simply mistaken as to the identity of the shrub, and that his hazelnut was nothing else than the Common Northern Alder [*Alnus incana* (L.) Moench] which is very abundant in the damp places about "Ruisseau à la lessive." The European Hazelnut is taller than ours and in this respect much like our Alder.

The sloping gravels that lead from the tableland to the beach are occupied by an association of trees and shrubs very likely—as hinted above—in their natural state. At the time of our visiting the white corymbs of a thorn *(Crataegus flabellata* (Bosc.) K. Koch.) were to be seen all over together with the ripe catkins of *Salix rostrata* Richardson var. *luxurians* Fernald. Others were *Nemopaathes mucronata* (L.) Trel., *Amelanchier sanguinea* (Pursh) DC., var. *gaspensis* Wiegand, and the northern variety of the Balsam Poplar *(Populus balsamifera* L., var. *Michauxii* Henry). This interesting tree exhibited its peculiar short cordate leaves.

Pointe-à-la-Baleine, the lower end of the island, is occupied by a flat and low gravel barren where only isolated patches of *Juniperus siberica* Burgsd., and stunted white spruce have been able to maintain their own. Not a blade of grass, not a weed, not a dandelion. The dwarfed trees assume the peculiar short conical shape and the densely felted habit observed on Anticosti. Sometimes the lower branches have developed and lie flat on the ground, and in a few instances, the tree, after ending in a point spreads anew giving to the whole the appearance of two superposed trees. This restricted growth and accompanying modifications is no doubt due to the continuous stress of the prevailing wind, the well-knownd *nord-est* of the lower St. Lawrence region.

One of the most puzzling things we collected during our short stay at Isle-aux-Coudres was a striking seminal variation of the Sugar Maple *(Acer saccharum* L.) It is known as distinct by the natives and Mr. Desgagné calls it "*Erable blanche.*" There is a grove of these trees at the Pointe-aux-Sapins, past "Ruisseau Rouge" and not far from the church. While taking a walk over there after supper in search of sunset effects, we noticed the peculiar appearance of the thin leaves, glaucous underneath some of which are perfectly three-lobed, and the remarkable fruit with wings curving inwards. The tree is clearly the var. *glaucum* of Sargent in its essential characteristics. We do not think it is necessary, however, in the absence of material from somewhere else, to impose upon the plant a new name, as it may be but a freak of a teratological instance.

[8]Casgrain, Abbé R. H., Excursion à l'Ile-aux-Condres.

NOTES AND OBSERVATIONS.

BREEDING OF MOURNING DOVE NEAR OTTAWA, ONTARIO.—On the afternoon of July 3, 1919, it was reported to me that a Passenger Pigeon was nesting in the orchard of Mr. R. T. Richardson, of Woodroffe Farm, near Britannia. I went out in the evening and Mr. Richardson showed me the nest, on a horizontal branch of an apple tree, on the northeast side, about six feet from the ground. The bird remained quietly on the nest and allowed us to examine her from all sides, first from a distance with field glasses, and later from a distance of only three or four feet. The bird had the typical light buffy grayish head and neck, with paler throat, and a small dark spot on each side of the head; wings with some dark spots—an undoubted specimen of the common Mourning Dove, *Zenaidura macroura carolinensis* (Linnæus). The lack of slaty blue on head and upper throat and the small size easily proved that the bird was not the Passenger Pigeon. The Mourning Dove is rare this far north in the east, although it ranges well to the northward in the prairie provinces. Mr. Richardson said that the dove had been sitting on eggs for about two weeks ,and when she finally fluttered off to the ground and away over the grass, we saw two blackish pin-feathered squabs on the scanty platform of a nest. The Passenger Pigeon is now believed to be extinct, but all of the many supposed occurrences of this species which have been investigated carefully have proved to be Mourning Doves. The two species have a general resemblance to each other, in shape, color, and proportions, and may be confusing when seen alone. The observer who will remember that the Mourning Dove averages only about 12.5 inches in total length while the Passenger Pigeon averages 17.0 inches as well as being fully twice the bulk of the former

species, as well as the distinctive color differences mentioned above, need make no mistake.

Mr. Richardson stated that he had caught as many as eighteen pigeons in a net at one time in the early days near Ottawa, and that the pigeons would soon clean up a field of peas, alighting along the rows and rapidly moving along, making short flights over each others' heads as soon as the spot was cleared of peas.

R. M. ANDERSON.

BACHMAN'S SPARROW AN ADDITION TO THE CANADIAN FAUNA.—One does not often have an opportunity of making an addition to the list of birds found in Canada, but when such an accomplishment is sought, the best place for the focus of effort is Point Pelee, where there is the maximum of chance to get southern stragglers. In the Bird Book, at Camp Coues, the headquarters of ornithological enthusiasm at the Point, there is a list of the species not yet recorded there, but regarded as among the immediate probabilities. In that list along with Pine Grosbeak, Red-bellied Woodpecker, Carolina Chickadee, and others, stood the name of Bachman's Sparrow, but on April 16, 1917, that name was erased. On that day, as the writer in company with Prof. J. W. Crow, was examining a lot of shrubbery at the north end of Mr. Langell's large orchard, our ears were met with a peculiar trilling song divided into two periods, the first at a lower pitch and much more rapidly delivered, than the second. The difference in pitch was one-fifth, and the speed of the first phrase was almost exactly twice that of the second. Neither of us recognized the song, and we were delighted on shooting it to find that we had the first Bachman's Sparrow to be recorded for Canada. The bird was a male and measured as follows: length 154 mm., wing 65, tail 63, tarsus 18. Records for northern Ohio are scanty, but there is a recent one for a locality opposite Point Pelee, recorded, I believe, in the Wilson Bulletin. The specimen is number 4140 in my collection.

W. E. SAUNDERS.

THE STATUS OF BEWICK'S WREN IN ONTARIO. The record of occurrence of this species in Ontario is brief and the number of observers concerned still briefer. It has been regarded as strictly casual, and the following statement of our knowledge of it is made with the hope of changing the present estimate.

The first specimen was taken by the writer on Dec. 12, 1908, about 25 miles west of London. The day was fairly mild, with a little snow on the ground, and the wren was found in the roots of a fallen tree, busily hunting for food. Recognizing it as an unusually dark wren, it was collected with the hope of gaining some knowledge about the family. When it proved to be a Bewick's a new species for Canada, interest was increased, but further search was unproductive until on April 24, 1909, one was heard singing, and was collected, from a tree immediately beside the "shack" at Point Pelee. The addition of another specimen on the 26th, from a different part of the Point, was the first real hint received that the bird was anything but a casual. Then our knowledge stood still for years. Stories came to our ears of large dark wrens, seen near the edge of the marsh in the winter and there was always the surmise that one of these might be taken, and prove to be a Berwick's, thereby supporting the idea that it was a regular inhabitant of the province. That hope has not been realized, and the identity of those so-called marsh wrens, wintering at the Point, is still a mystery. But on April 1, 1917, another Bewick's Wren was seen and heard to sing within 25 yards of the house. The next day, Sunday, he was still around, and on Monday came the great event in the world of wrens, when we saw and heard no less than five birds, and felt that we would not be too destructive in taking one of them, which we did.

Our experience at the Point is that every so often (a phrase that succinctly expresses the exactness of our knowledge in the matter) there comes a day when some species has *its day* of migration. We have seen the days of Bluebirds, Blue Jays, male Marsh Hawks, Black Poll Warblers, etc., and, here, at last, seemed to be the day of Bewick's Wren. Five in one day of a species of which all the previous years had disclosed but three, was truly a great number, and tells in terms not to be denied, that Bewick's is a regular resident of Ontario, whose exact domicile in summer is yet to be disclosed. Time alone will tell if this theory is correct, and it may easily prove that the instance is one of varying abundance, so often exhibited in the case of species studied at or near their northern limit.

W. E. SAUNDERS.

INDEX TO VOLUME XXXIII.

PAGE

Acanthis linaria linaria 112
Accipter velox 111
Acipenser transmontanus 50
Actitis maculata 5, 111
Aegialitis semipalmata 111
Agelanius phoeniceus 13
Ammodramus bairdii 15
Ammodytes americanus 21
" *dubius* 21
" *personatus* 21
Anas boschas 5
" *rubripes* 20
" *sponsa* 20
Anderson, R. M., articles by 86, 101, 117
Animals, Wild, of Glacier Nat. Park 101
Antrostomus vociferous 12
Anthus rubescens 18
" *spraguei* 18
A.O.U. check list, 4th an. list, proposed changes 100
Archaeology as an aid to Zoology 63
Archibuteo, Status of 106
Archilochus colubris 12
Arenaria interpres morinella 111
Astragalinus tristis 15, 91
Astur atricapillus atricapillus 111
Auk, articles in 100
Auk, Prehistoric Range of Great 70
Birds of California, Game 82
Birds in Relation to Sunflower Growing in Manitoba 90
Birds, Migratory, Convention 58
Bird Migration 37
Birds, Popular Names of 100
Birds of Northern Saskatchewan and N. Manitoba, collected in 1914 by Capt. Buchanan 109
Bid Protection in Canada 36
Birds of Red Deer River 100
Bird Sanctuary, an Ontario 62
Bird Study from a Duck Blind 79

PAGE

Blackbird, Brewer's 14
" Red-winged 13
" Rusty 14, 112
" Yellow-headed 13
Bluebird, Mountain 21
" 19
Bobolink 5, 13
Bombycilla cedrorum 5, 17, 113
" *garrula* 113
Book Notices and Reviews 22, 41, 82 99
Botanical Notes—Isle-aux-Coudres 114
Botrychium obliquum dissectum 97
Bittern, Least 20
Bunting, Snow 15, 112
Burbot 54
Burwash, Armon, article by 61
Buteo platypterus 111
Calcarius lapponicus 15
" *ornatus* 15
Calidus leucophaea 111
Canachites canadensis canadensis 111
Canada—How an Algonquin Country Received an Iroquois Name 61
Canoes, Canadian Aboriginal 23
Carex paupercula 115
Carices, Types of Canadian 72
Carpodacus purpureus 14, 112
Catostomus commersonii 53
" *casostomus* 53
" *griseus* 53
Catbird 18
Certhia familiaris 19
Ceryle alcyon 12
Champlain's Astrolabe 103
Charadrius dominicus dominicus 111
Chelydra serpentina 61
Chickadee, Hudsonian 113
" Black-capped 19
Chipmunk, Behavior of 92
Chordeiles virginianus 5, 12
Chrysemys m. marginata 61
Clangula c. americana 57
" *islandica* 57

PAGE

Cistothorus stellaris 19
Clemmys guttata 61
Coccyzus erythrophthalmus 12
Colaptes auratus 12
" *a. borealis* 112
Coluber c. constrictor 60
Colymbus holoelli 110
Coregonus labradoricus 51
" *williamsi* 50
Cornus corax 13
" *c. principalis* 112
" *brachyrhynchos* 5, 13, 112
Couesius dissimilis 53
Cowbird 13
Creeper, Brown 19
Cristivormer namaycush 52
Criddle, N., articles by 41, 90
Crossbill, Red 91
" White-winged 91
Crotalus horridus 61
Crow, American 5, 13, 112
Cuckoo, Black-billed 12
Cyanocitta cristata 13
Dace, Long-nosed 53
" Saskatchewan 53
Davidson, J., article by 6
Dendroica a. aestica 5, 17, 113
" *blackburniae* 5
" *castanea* 17
" *coronata* 17, 113
" *fusca* 17
" *magnolia* 17
" *palmarum* 18, 113
" *pennsylvania* 17
" *striata* 17, 113
" *tigrina* 17
" *virens* 17
Dolichonyx oryzivorus 5, 13
Douglas Fir Sugar 6
Doré 54
Dove, Mourning, near Ottawa 117
Dowitcher 110
Dryobates pubescens 12
" *villosus* 12
Duck, Black 20
" Scaup 5
" Wood 20
Dumatella carolinensis 18
Eagle, Northern Bald 111
Eater, Spawn 53

INDEX—*Continued.*

PAGE

Elaphe vulpina ---------- 60
Empidonax flaviventris---- 12
" *minimus*---13, 112
" *trailli*--------- 13
" " *alnorum*-- 112
Emys blandingii--------- 61
Ereunetes pusillus ------- 111
Emphagus carolinus----14, 112
" *cyanocephalus*-- 14
Fabre, J. H., Works of-- 41
Falco c. columbarius----- 111
Farley, F. L., article by-- 38
Finch, Gold ----------15, 91
" Purple --------14, 112
Fishes of Alberta-------- 50
Flicker ----------12, 112
Fleming, J. H., Collection of Birds ---------- 101
Fleming, J. H., article by-- 109
Flycatcher, Alder ------- 112
" Crested ------- 12
" Least ------12, 112
" Olive-sided--12, 112
" Traill's ------- 12
" Yellow-bellied-- 12
Gallinago delicata ------- 110
Gavia immer ---------- 110
Geothlypis trichas ------- 18
Gibson, A., notes by---22, 41
Goldeneye, American ---- 57
" Barrow's ------ 57
" Western ------ 50
Goshawk, American ----- 111
Gowanlock, J. N., article by 1
Grackle, Bronze -------- 14
Grebe, Holboell's -------- 110
Grizzly, Barren Ground-- 77
Grosbeak, Evening ------- 14
" Rose-breasted -- 16
Groh, H., note by ------- 40
Gull. Bonaparte's -------- 110
" Herring ---------- 4
" Ring-billed ------5, 110
" Short-billed -------- 110
" Sabine's ---------- 110
" Glaucus, reasons for discarding proposed race of ---------- 100
Haliaeetus l. alascanus---- 111
Halkett, A., notes by 21, 22, 40, 98
Hawk, Broad-winged------ 11
" Night ----------5, 12
Hawk, Pigeon --------- 111
" Sharp-shinned ---- 111
Helodromus s. solitarius--- 111
Hewitt, C. G., article by-- 62
Henry, J. K., article by---- 94
Hesperiphona vespertina--- 14
Heterodon contortrix ----- 60
Hirundo erythrogaster ---- 16
Holm, Theo., article by--- 72
Homarus americanus ---- 22
Hummingbird, Ruby-throated 12
Hydrochelidon n. surinamensis ---------- 5
Iridoprocne bicolor-----16, 113
" *fuscescens* ----- 19
" *guttata* ------- 19
" " *pallasi*-- 113
" *ustulata* ------- 19
" " *swainsonii* 113
Hyodon chrysopsis ------ 50
Icterus galbula --------- 14
Ixobrychus exilis -------- 20
Jaeger, Parasitic -------- 1
Jay, Blue ---------- 13
" Canada------13, 40, 112
Junco hyemalis ---------- 16
Junco, Slate-colored ----- 16
Kapuskasing, Flora of---- 33
Kildeer ---------- 111
Kindle, E. M., article by-- 96
Kingbird ---------- 12
Kingfisher, Belted ------- 12
Kinglet, Ruby-crowned_19, 113
Kinosternon odoratum----- 61
Kirkconnell, T. W., article by ---------- 33
Klugh, A. B., article by--- 92
Lagopus, l. lagopus------- 111
Lambart, H. F. J., article by ---------- 77
Lanius borealis ---------- 113
" *ludovicianus* ----- 17
Lanivireo solitarius ----17, 113
Lark, Horned ---------- 13
" Western Meadow-- 14
Larus argentatus -------- 4
" *brachyrhynchos*---- 110
" *delawarensis*-----5, 110
" *philadelphia* ------ 110
Laing, H. M., articles by- 99
Latchford, Hon. Mr. Justice, article by ------ 83
Lewis, H. F., article by--- 58
Ling, Fresh water ------- 54
Lobster, notes on------22, 40
Lochhead's Class Book of Economic Entomology 41
Longspur, Lapland ------ 15
" Chestnut-colored 15
Lota maculosa ---------- 54
Loon ---------- 110
Loons, Geographical variations in the Black-throated ---------- 100
Lloyd, Hoyes, article by-- 93
Lucius lucius ---------- 53
Macnamara, C., article by- 103
Macoun, J. M., note by--- 42
Macrorhamphus griseus griseus ---------- 110
Magpie ---------- 13
Mallard ---------- 5
Mammalogists, American Society of ---------- 21
Mammals, Field Studies of Life-histories of------ 86
Martin, Purple ---------- 16
Marila affinis ---------- 5
" *marila* ---------- 5
Mergus americanus ------ 110
" *serrator* -------- 110
Melanepres erythrocephalus 12
" *c. erythrophthalmus* 48
Meleagris gallopavo ----- 68
Melospiza georgiana ----- 16
" *lincolni* -------- 16
" *melodia* 16
Merganser ---------- 110
" Red-breasted -- 110
Minotilta varia ------17, 113
Minnow, Prairie -------- 53
Molothurus ater -------- 13
Monostoma lesueuri ----- 53
Mousley, H., articles by-37, 97
Mud-Crack Horizons, Climatic interpretation of new early Ordovician 96
Munro, J. A., article by-- 79
Museums as Educational Institutions --------- 10
Mustela cicognanii ------ 12
" *longicauda* ------ 43
" *novaboracensis* --- 45
" *rixosa* ---------- 43
Myiochanes virens ------- 12

INDEX—*Continued.*

PAGE

Myiochanes virens 12
Nannus hiemalis hiemalis .. 19
Nettion carolinense 110
Nuthallornis borealis ... 12, 112
Nuthatch, Red-breasted .. 19, 113
Notes and Observations 40, 61, 98, 117
Notropis jordani 53
" *hudsonius* 53
" *scopifer* 53
Oberholser, H. C., articles by 48, 95
O'Donoghue, C. H., article by 1
Ottawa Field-Naturalists' Club, Rep. year ending March, 1918 20
Oidemia deglandi 5
" *perspicillata* 110
Oncorhynchus kennerlyi ... 51
Oporornis agilis 18
Oriole, Baltimore 14
Ornithological collector and the law 93
Osprey, American 111
Otocoris alpestris 13
Ovenbird 18
Owl, American Hawk 112
Oxyechus vociferus 111
Pandion haliaetus carolinensis 111
Pantosteus jordani 53
Partridge, Hudsonian spruce 111
Passerella iliaca 16, 113
Passerherbulus lecontei .. 15, 112
" *nelsoni* 15
Passerculus sandwichensis 5, 15, 112
" *lecontei* 112
Patch, C. L., articles by .. 40, 60
Payne, F. F., article by ... 40
Pecten tenuicostatus 98
Pelidna alpina sakhalina .. 111
Pelican, White 5, 38
Penthestes atricapillus 19
" *hudsonicus hudsonicus* 113
Pelecanus erythrorynchus .. 38
Perca flavescens 54
Perch, Pike 54
" American 54
" Yellow 54

PAGE

Perisoreus canadensis 13, 40, 112
Petrochelidon albifrons hypopolia .. 95
" *lunifrons* .. 16, 113
Pewee, Wood 12
Phalaropus fulicarius 110
Phalarope, Red 110
" Wilson's 110
Picoides arcticus 112
" *americanus fasciatus* 112
Phoebe 12, 112
Pica pica 13
Pickerel 54
Pike, Common 53
" Wall-eyed 54
Pipit, American 18
" Sprague's 18
Pipilo erythrophthalmus ... 16
Pisobia fuscicollis 111
" *bairdii* 111
" *minutilla* 5, 111
" *maculata* 5
Platygobio gracilis 53
Planesticus migratorius ... 19
Plestiodon fasciatus 60
Plectophenax nivalis 5, 112
Plover, American Golden .. 111
" Semipalmated 111
Poocaetes gramineus 15
Progne subis 16
Ptarmigan, Willow 111
Pseudotsuga taxifoia 6
Quiscalus quiscula 14
Raven 13
" Northern 112
Redpoll 112
Redfish, Little 51
Redstart 18
Reese's Outlines of Economic Zoology 22
Regulus calendula 19, 113
Ribes divaricatum 94
" *Lobbii* 94
Ridgway's Birds of Middle N.A. Part VIII 99
Riparia riparia 16, 113
Rhinichthys cataractae dulcis 53
Robin, American 19
Robins, Winter in N.S. 100
Robin's Mistake 98
Roup, Epidemic of in Crow Roosts 40

PAGE

Rydberg's Key to the Rocky Mountain Flora 42
Salmo clarkii 51
" *rivularis* 51
" *kamloops* 51
Salmon, Kennerly's 51
Salvelinus fontinalis 52
" *parkii* 52
Sand Launces 21
Sanderling 111
Sandpiper, Baird's 111
" Least 5, 111
" Red-backed 111
" Pectoral 5
" Spotted 5, 111
" Semipalmated 111
" Solitary 111
" White-rumped 111
Sapsucker, Yellow-bellied 12, 112
Sauger 54
Saunders, W. E., articles by 55, 118
Sayornis phoebe 12, 112
Scallop, Metamorphosis of 98
Scoter, White-winged 5
" Surf 110
Scott, W. L., note by 98
Sereirus aurocapillus 18
" *novaboracensis* 16, 113
Setophaga rusticilla 18
Shoal Lake, Man., Birds of 12
Shirke, Loggerhead 17
" Northern 113
Sialia currucoides 21
" *sialis* 19
Siskin, Pine 15, 90
Sitta canadensis 19, 113
Skink, Blue-tailed 60
Snake, Hog-nosed 60
" Black Racer 60
" Fox 60
" Garter 60
" Rattle 61
Snipe, Wilson's 110
Soper, J. D., article by 43
Sparrow, Baird's 15
" Bachman's 118
" Clay-colored 16
" Chipping 16, 113
" Fox 16, 113
" Gambel's 113
" Harris's 15, 12

INDEX—*Continued.*

PAGE

Sparrow, Leconte's....15, 112
" Nelson's 15
" Savanna...5, 15, 112
" Swamp 16, 113
" Song 16, 113
" Tree 16, 113
" Vesper 15
" White-crowned.. 15
" White-throated .. 16
Species, Reality of..... 100
Sphaerium sulcatum 84
Sphaeriidae, Canadian 83
Shiner, Jordan's 53
Sphyrapicus varius varius.. 112
Spinus pinus 15, 91
Spizella m. monticola.... 16
" *monticola* 113
" *passerina* 16
" *passerina passerina* 113
" *pallida* 16
Steganopus tricolor 110
Sterna caspia 1
" *forsteri* 5
" *hirundo* 5, 110
Sternella neglecta 14
Stercorarius parasiticus ... 1
Stizostedion vitreum 54
" *canadense* ... 54
Sturgeon, White 50, 53
Sucker, Common 53
" Gray 53
" Mountain 53
" Northern 53
Surnia ulula caparoch..... 112
Swallow, Barn 16
" Cliff 16, 113
" Tree 16, 113
" New Cliff, from Canada 95
Syphrapicus varius 12
Tamias striatus lysteri.... 92
Taverner, P. A., articles by 12, 57, 82, 99, 100
Teal, Green-winged 110
Telmatodytes palustris.... 19
Tern, Caspian, Notes on.. 1
" Black 5
" " in Georgian Bay 55
" Common 5, 110
" Forster's 5
Thamnophis s. sirtalis 60
Thrasher, Brown 19
Thrush, Alice's..... 19

PAGE

Thrush, Gray-cheeked 113
" Hermit 19, 113
" Northern water... 18
" Olive-backed..19, 113
" Water 113
" Wilson's 19
Thymallus tricolor montanus 52
Totanus flavipes 5
Towhee 16
Townsend, Chas. W., Letter from 36
Toxostoma rufum 19
Trout, Brook 52
" Bull 52
" Cut-throat 51
" Dolly Varden 52
" Great Lake 52
" Kamloops 51
" Silver 52
" Speckled 52
Turnstone, Ruddy 111
Turkey, Wild 68
Turtle, Blanding's 61
" Mush 61
" Snapping 61
" Spotted 61
" Painted 61
Tyrannus tyrannus 12
Ursus internationalis 77
Vermivora celata 17
" *peregrina*..17, 113
" *rubricapilla* .. 17
Vireo, Blue-headed 113
" Philadelphia 17
" Red-eyed....5, 17, 113
" Solitary 17
" Warbling 17
Vireosylva gilva 17
" *olivacea*..5, 17, 113
" *philadelphia* ... 17
Victorin, Bro. M., article by 114
Warbler, Black and white 17, 113
" Bay-breasted ... 17
" Black-poll ..17, 113
" Blackburnian..5, 17
" Black-throated green..... 17
" Canadian 18
" Cape May 17
Warbler, Chestnut-sided .. 17
" Connecticut 18

PAGE

Warbler, Mangolia 17
" Mourning 18
" Myrtle 17, 113
" Nashville 17
" Orange-crowned.. 17
" Palm 18, 113
" Tennessee....17, 113
" Yellow ..5, 17, 113
" Wilson's 18, 113
Warblers of genus *Dendroica*, Problems suggested by nests of... 100
Washburn's Injurious Insects and Useful Birds 22
Waugh, F. W., article by 23
Waxwing, Bohemian 113
" Cedar ..5, 17, 113
Weasel, Least 43
" Long-tailed 43
" New York 43
" Short-tailed 46
Whip-poor-will 12
Whitefish, Labrador 51
" Rocky Mountain 50
Whitehouse, F. C., article by 50
Williams, M. Y., articles by 10, 40
Wilsonia canadensis 18
" *pusilla* 18, 113
Wintemberg, W. J., article by 63
Woodpecker, Alaskan three-toed 112
" Arctic three-toed 112
" Downy 12
" Hairy 12
" Red-headed..12, 49
Wren, House 19
" Long-billed 19
" Short-billed 19
" Winter 19
" Bewick's in Ontario.. 118
Xema sabini 110
Xanthocephalus xanthocephalus 13
Yellow-throat, Maryland.. 18
Zamelodia ludoviciana 16
Zenaidura macroura carolinensis 117
Zonotricha albicollis..... 16
" *leucophrys* 15
" " *gambelii* 113
" *guercula* 15, 112

THE CANADIAN FIELD-NATURALIST

VOL. XXXIV. JANUARY, 1920. No. 1.

FALL MIGRANTS.

By L. McI. Terrill, St. Lambert, Que.

(Read before the Province of Quebec Society for the Protection of Birds.)

An airman recently expressed the belief that the increasing interest in air navigation would eventually tend to induce a seasonal movement on the part of the human race. Even now many wealthy people spend the winter in Florida and California. In the days of the stage-coach, less than a century ago, this was unthought of. At that time a journey to the nearest town, even to one's nearest neighbor, was often an event. Only with the harnessing of steam and electricity was the Californian or Floridan trip possible to the northerner. Who can say what the mastery of the air will produce within another century.

Such thoughts should stimulate us in the study of bird movements—the migrations of these pastmasters in aeronautics. However, anyone who has become well launched in this study needs no such stimulant. Each recurring season he is refreshed by the return of familiar birds and thrilled with a glimpse of others that journey on to a more northern home. In the fall the southward journey completes the two movements known as bird migration—or rather I should reverse the order—the spring movement is the return home. Should it happen that certain birds, moving south in the fall, were to remain there, they would be emigrants from our point of view and immigrants from the southerner's viewpoint. Migration entails a return journey.

In this latitude the spring migration may be said to commence in February and finish in June; while the fall migration commences in July and extends into the winter, making an almost continuous movement of one sort or another, throughout the year, with the exception of three or four weeks during June and July, which marks the height of the nesting season in the north. Thus the fall migration covers late summer, autumn, and early winter, and the term is one of convenience as it marks the height of the movement.

To the novice, who has watched the return of birds in the spring for the first time, there is a vast difference in watching their fall departure. If you consider merely the facility in naming birds as they pass and repass, the spring time is the most favorable for observation. In the first place, after our long winter we are eagerly awaiting the birds that we associate with warmer weather, and so most northerners are to some extent familiar with the appearance of our common birds in spring, although it is often the song that is welcomed—if it were not for the song many birds might escape notice. When recording the return of our summer resident birds one has these advantages. The bird is in full plumage (with rare exceptions) limited at most to two phases (male and female); it is generally in song, and one is more keenly on the lookout for it. Familiarity with the bird throughout the summer begets carelessness about its departure and the last birds are apt to slip away unnoticed. On the other hand those that merely pass through this district to nest farther north are often in a hurry—they may linger in the states to the south, but when this latitude is reached they appear to have an important appointment elsewhere and we miss seeing many of them.

In the fall these northerners are more leisurely; the call to move south is seldom so insistent and we have more opportunity to watch them. Again, they keep more in the open—one sees birds of the deep woods right at his door-step. Many times before starting on an all-day walk I have taken a preliminary survey in my garden, and have seen there the rarest birds of the day.

The feature that makes fall study at once a delight and a torment is the many different plumages often found in one species. Thus we may see juvenile birds changing into first fall plumage, those of an earlier brood that have already assumed fall dress, and adult birds in various stages of moult, all in the same flock. If, as is often the case, you are watching a mixed flock of birds that contains species with close resemblances and all in constant motion, confusion may reign.

In regard to classifying birds the disadvantages in studying fall migration are chiefly, comparative absence of song and greater variation of plumage;

while the advantages are a greater tendency on the part of many forest birds to come into the open, and to linger in orchards and gardens, even in the heart of the city.

This fact gives us at least one distinct and much needed advantage. During the height of the spring migration (April and May) there is a plentiful supply of water in the shape of surface pools and running streams, and the weather is cool. During the corresponding period of the fall migration (August and September) the country is much drier; few surface pools are found and the average temperature is higher.

I well remember one late summer's day, several years ago, passing through a small wood and hearing the call of some chickadees. As the chickadees were moving in my direction I awaited them to see what their travelling companions might be. Nature lovers generally are well aware of the chickadee's sociable nature during migration. Very soon I heard faint *tsips* and *tseeps*, and saw the vanguard of a flock of warblers and other birds. Instead of flitting past in the tree tops, they dropped to the ground about twenty-five feet away in a small glade where I joined them and found the ground about a small water hole literally covered with birds, all pressing forward for a drink and a bath. Others kept continually dropping to the ground and I soon counted a dozen species with scarcely any trouble, a contract that might have taken hours of observation under ordinary circumstances.

I found that this was the only supply of water in the vicinity and I was so impressed with the advantage of being enabled to view the birds from all angles at close range that I went home, resolved to build a bath in my garden. I merely dug out a shallow basin beneath a spruce tree a few feet from the dining-room window, and lined it with concrete. Since then I have been enabled to watch birds and dine at the same time. I must admit that it is sometimes a source of uneasiness to members of my family, alhough latterly some of them have become so interested in watching, for instance, a robin holding the bath against all comers, that they, too, have forgotten the more immediate purpose of the dining-room.

The study of migration is very exacting—pleasurably so. If one is keen to identify all of the passing birds he is liable to be dubbed a crank. I am constantly making observations from a car window, often to the disgust of my travelling companion, who may be in the midst of an anecdote. One cannot always choose ornithologically inclined company, and further one is loath to lose the psychological moment for an observation that may never occur again. Then there is the desire to give pleasure to another or rather to share the pleasure of your discovery with another. Some weeks ago (Oct. 6) while half-asleep about midnight, I became suddenly alert at the repeated calls of a screech owl, coming in through my open window. I was so overjoyed that I immediately awakened my brother. On the night of Oct. 14, about the same time, I could scarce believe myself awake when I heard *sch'wet, sch'wet*, from the garden. Actually a saw-whet owl saw-whetting right under my window. On this occasion experienced warned me to restrain my enthusiasm and I listened alone. With regard to the screech owl, it seems to me that it is becoming more common in this district; that there is an apparent movement from south to north. Previously I had seen it occasionally, but this season I found its nest once and heard its notes on three occasions; once at St. Lambert, once at Lacolle, and again near Chambly. I have also heard other reports of its presence in other localities near Montreal. I cannot imagine why it was called screech owl—perhaps the original namer had conjured some terrible apparition after a bad fright and named it after his emotions. To me it sounds a soft, tremulous *whe-e-you-ou-ou*, repeated at short intervals.

When making the bath in the garden I thought, perhaps selfishly, that if my neighbor's gardens had no greater attractions than my own, in the matter of food and protection, my garden would still have to its credit a bird bath and drinking pool, which would attract some of my neighbor's birds. This it has done, and further, it has been the means of prolonging their stay. However, I did not carry my selfishness to an extreme and have since induced some of my neighbors to instal bird baths. As previously stated, the great advantage of the bath is that it brings the birds to the ground and enables you to see distinctly the markings of the upper plumage—an impossible feat when birds are in the top foliage of trees. This is especially true of warblers. Often in the fall when the yellowing leaves are drifting it is even difficult to say which are leaves and which are warblers. Moreover, I can safely say that it would be possible for me to follow the fall migration of most of our small perching birds without leaving the vicinity of the bird bath. I call it a bath instead of drinking pool, because as a bath I count it a greater attraction, as most birds can obtain sufficient water for drinking purposes from the beads of dew found in early morning on leaves and grass blades. As it would take too much space to discuss the fall migration in all of its phases I am going to speak more particularly of these garden visitors that can be observed by anyone who has a yard with vegetation, at a maximum cost of fifty cents and an hour's

labor. Of course you will have the trouble of keeping the bath filled with water, but with a garden hose it is a simple matter.

It has been my custom for several seasons to spend a few moments daily watching this bath. Even five minutes will give surprising results. In comparison with field notes, I find that the collective results give a fairly accurate idea of the birds prevailing at any time, except during very wet or cold weather.

After the middle of July, when vegetation is beginning to lose its bloom, and the cicadas are commencing to sing, I look in my garden for the first signs of migration. There are already arrivals to be seen along the beaches, such as certain shorebirds that start south early in July, but I am going to confine myself to birds that may be found in gardens. At this time you will find the usual concourse of summer resident garden birds at the bath—such as song and chipping sparrows, catbirds, robins, red-eyed vireos, wood peewees, yellow warblers, always the domestic sparrow, and possibly the Baltimore oriole, if it has not already effected its usual mysterious disappearance. Here is a chance for investigation. We know there is a period when the oriole stops singing in the garden, but does it really leave? There seems to be no direct evidence on this point. In the lot adjoining our garden there are some huge elm trees, that might harbor dozens of orioles in the dense foliage of the upper branches. I have caught glimpses of them there, also of wood pewees, catbirds, robins, and vireos, at times when their absence from the garden proper was very apparent. Go to the woods at this time and you will find a corresponding scarcity of birds. Occasionally you will get a glimpse of vireo, flycatcher, or warbler, feeding young in the upper foliage, but where are the many birds one saw earlier in the season? Are they, too, sitting motionless in the tops of the trees? Comparatively few of them have commenced to migrate. A little later when they commence to appear in force in our gardens we know the reason for the deserted woods. Perhaps the fact that there is little to attract us to the woods in late July and August is responsible for our lack of knowledge in regard to the habits of moulting birds. True, there are fewer mosquitoes, but I find the immense numbers of spiders that spin their webs everywhere, even a greater nuisance.

When I note the inactivity of birds during the moulting period, I am reminded of the custom of human beings at Easter. After wearing out their old clothes during the winter there is a blaze of color and activity on Easter morning. However, we cannot draw parallels between the habits of birds and human beings. There is probably a more vital reason for the retiring habits of birds during the moulting season. For one thing their loosening feathers and ragged plumage may induce a distaste for flight. They may feel handicapped in the struggle with their enemies and so remain in seclusion until new feathers have replaced the old. Whatever the reason for the oriole's disappearance we know that for about two weeks during the latter part of July they do not sing in our gardens. I usually hear them again at the end of July or beginning of August.

We have, in St. Lambert, a flock of bronzed grackles that nest in the neighborhood and often visit the garden. I have come to the conclusion that the grackle does considerable damage in gardens, although I have never had the heart to disturb them. For instance, my corn suffered. A year ago I planted it in shallow drills and the blackbirds promptly ate it. This year I planted it so deeply that it rotted in the wet soil. Later, they turned their attention to the peas and ripped open some of the pods. However, I am repaid to some extent by their increasing tameness. They are not greatly addicted to bathing—they merely splash noisily through the water in their course over the lawn. Once my sister called attention to a new bird in the bath. It was merely another grackle, a high plumage male, with an exceptional sheen of bronze and bluish-green on its head and back, in great contrast to some sober colored females nearby.

One of the first signs of a bird movement is the appearance of an occasional downy woodpecker in the garden. I have never seen this bird enter the bath, but have seen individuals clinging to a spruce tree near it and evidently thoroughly enjoying a shower from the garden hose. When in a hurry to discover what birds are in the garden I sometimes arrange the hose so that a fine spray falls over the bath and spruce tree. This quickly attracts most birds and it is much enjoyed by otherwise diffident bathers. I have frequently watched that model of industry, the downy woodpecker, as it examined the spruce tree for larvae, suddenly stop as it reached the arc of the spray, fluff out its feathers and settle down for a bath.

The birds that I usually see next are the redstarts in various plumages—family parties that have nested in the vicinity (they never nest in the garden). The redstart, like most of the warblers, is a great bather. It usually appears between August 5 and 16, and is closely followed by black and white and chestnut-sided warblers. Most of these early comers are still in family parties. The black and white warbler is especially fond of a good bath. I have seen one, with a mixed lot of warblers, settle down in the shallow water and remain for several minutes after

the others had sought a perch to sun and preen themselves.

Last year (1918) the myrtle warbler was the first migrant warbler seen in the garden, arriving on July 31. In 1919 they were first noted on August 10, which is nearer the average time. I can usually find a few in the garden on any day after their arrival until late in October. Occasionally a few remain after the first of November. This bird is the first migrant to come from a distance (referring only to garden visitors). Their nearest nesting haunt that I know of is in the Laurentian hills.

The water-thrush is one of the earliest birds to come, as is also the Canadian warbler. I never see many of the latter, but the water-thrush is a regular visitor. As is well known it is one of our thrush-like warblers, resembling the ovenbird, but lacking the orange crown-patch. It can always be distinguished from the ovenbird by its sew-saw walk, very similar to that of the spotted sandpiper. I seldom see the ovenbird in the garden; it is one of the few of the smaller birds that keeps almost entirely to the woods, but the water-thrush delights in inspecting moist lawns. It is not a great bather, but loves the vicinity of the bath. Even though indoors I usually know of his presence—his loud *clink* or *cleenk* has a very penetrating quality, and I generally come out to watch this daintily marked "tip-up" as he zig-zags down a spruce limb and inspects the wet lawn before taking a light bath. In its summer home the water-thrush lives in the shadows—in the cool wet woods—and in the garden, too, it is more active during the twilight of early morning and late afternoon, and is generally the last to bathe. The sew-saw motion of the water-thrush, and certain other birds, has always excited my curiosity.

The semipalmated sandpiper, almost wholly a bird of the beach (during migration), follows the shore line by little runs and never bobs its body. Continual necessity for rapid action in avoiding the incoming waves may be responsible for this mode of advance. This small sandpiper keeps to the shore level and avoids boulders and other obstacles in its path. On the other hand the spotted and solitary sandpiper and the pipit, when feeding on the beach, generally examine the tops and boulders. It seems probable that similarity in feeding habits is responsible for the bobbing motion common to these three birds. Did the water-thrush acquire its similar motion in a like manner and has it only recently left a water habitat for the woods? Watch a spotted or solitary sandpiper as it flies from stone to stone in the bed of some swift-flowing brook, balances a moment on the polished slippery surface, and creeps to the edge in its search for food amongst the clinging mosses, and you will readily perceive one reason by which the "tip-up" may have acquired its motion. Even a sandpiper may not relish an unpremeditated ducking. The balancing of the spotted sandpiper is the most pronounced, while the solitary bobs spasmodically, as befits a sandpiper that has adopted the habit of rearing its young in trees, although it has not yet learned the art of nest-building.

Often the bay-breasted warbler is amongst the first arrivals. They are always in flocks and by the time they appear the fall moult is almost if not quite complete. It is difficult to reconcile their fall dress with that of the spring. About the only recognition marks to be distinctly seen are the white wing bars and spots on the outer tail feathers and these marks are common to other species. Here is where the value of the bath is felt. If you look closely you can usually make out a little bay color on the sides, sometimes deepening to chestnut, according to the age or sex of the individual. This will serve to distinguish it from the young of the black-poll which often associates with the bay-breasted and which it resembles closely. I have watched these birds carefully during the past few years and have come to the conclusion that the bay-breasted far outnumbers the black-poll, at least in this district during the fall migration. It is a pretty sight to see the bright yellowish-green backs of half-a dozen or more of these birds as they bathe in perfect harmony. The bay-breasted warbler comes early and remains late and is one of the most common fall garden visitors. In 1919 they were noted from August 20 until September 21.

The Cape May, Magnolia, Nashville, and Tennessee warblers follow more or less closely. It seems almost unreal to see a Tennessee warbler composedly bathing a few feet away. It is quite a contrast to watching them in their nesting haunts where they seldom approach closer to you than the tip of some dead bleached limb, fifty feet or more from the ground. Then the male bird's breast feathers were a dazzling white, now they are a dusky yellow or yellowish-white.

On Aug. 10 this year I saw the first white-throated sparrow in the garden, but they did not become common until the second week in September. They were always to be seen from that time until late in October. Most of the sparrows are fond of bathing, but are not as energetic about it as the warblers.

Vireos are much less given to bathing. They are usually content to perch beneath the spray and allow the mist to fall over them. Often they will dive through it and occasionally take a proper dip in the bath. The red-eyed vireo is found in the garden

throughout the summer, sometimes until October. The warbling vireo is less common, while the solitary and Philadelphia are rare visitors. I have only one record for the latter—August 11 (1918). It is a beautiful little bird, much smaller than the red-eyed vireo, and with a great deal of greenish-yellow in its make-up. I watched it glide along the elm twigs until it seemed a part of the foliage and melted from view. The pursuit of its prey—the small hairless caterpillars, lying inactive in the curled-up elm leaves—called for a smooth, unhurried progress. These caterpillars are very attractive to other vireos and especially to the Baltimore oriole.

Flycatchers act much like vireos toward the bath. The wood peewee takes an occasional bath, but more often simply flies from perch to perch, back and forth through the spray. It is loath to remain long away from its beloved perch. Dabbling in a bath gives opportunity neither to flip its tail nor snap up passing insects.

Another speedy bather is the ruby-throated hummingbird. I have never seen it do more than dive through the spray at the usual rapid gait. The ruby-throat is a color specialist. I have not known it to nest in the garden, but it often visits us during August and September—even as late as Sept. 14; it is generally found about flowers of a reddish hue. Sometimes late flowering scarlet runners are its objective; again the orange lily is chosen.

This brings us well into September. The yellow warbler has gone entirely. It disappears suddenly and very regularly about the end of August or during the first few days of September. As we are near the northern limit of this warbler's range in the east, there are few arrivals from the north to take the place of departing local birds.

The Maryland Yellow-throat is liable to visit the shrubbery at any time in September, but that is as far as it gets. I have never seen one bathe. Although August (in the garden) is essentially a warbler month, there are a few of them that I generally fail to see before September—such as the black-throated blue, black-throated green, and yellow palm warblers. They stay here quite late but the myrtle outcomes and outstays them all.

If August is a warbler month, then September might be called a sparrow and thrush month. Besides the robin and bluebird I have seen four of the true thrushes in my garden—Wilson's, olive-backed, gray-cheeked, and hermit—and all but the gray-cheeked bathed. The robin and the olive-backed thrush are especially fond of a bath and they bathe very thoroughly. The true thrushes are mild-mannered, but the robin finds the bath all too small to permit of mixed bathing, and generally chases other birds away. Some of them are discouraged for a time, but not so with the song sparrow. I have often watched this persistent little fellow dodging in and out, looking for an opening, until the larger birds finally vacated the bath.

The robin has a far northern range, which is indicated by repeated influxes during September and October. One may fail to see them for a time and then some morning the lawn will be dotted with them. The lawn is the robin's market-place. I watched an amusing incident one day. A robin had just pulled a worm from its retreat and landed it safely on the ground when another robin darted up and seized it. It was amusing to see the wild chase that followed.

The white-crowned sparrow usually arrives about Sept. 18, and can often be heard singing a low-voiced song. Never a boisterous singer, its fall song is especially subdued. Most of the sparrows are now in the midst of a song revival, but the songs are usually incomplete and faintly uttered; sometimes a mere whisper of the spring song, and at other times quite different from it. As the weather becomes cooler the song often changes in volume and quality until frequently the full spring song is uttered.

Many birds sing but a portion of the mating song. The Tennessee warbler, for instance, gives only about half of its full song, but it can always be recognized by the piercing insistence of the climax note. Little appears to be known as to what proportion of these unfinished songs is the product of mature and immature birds. Much might be learned in regard to subspecific relations from a study of immature birds' songs.

About the time of the white-crown's arrival there is an influx of chipping sparrows from the north, and the purple finch is liable to visit the garden at any time in September. Both of these birds are fond of a bath. Red-breasted nuthatches are seen about Sept. 16, closely followed by the brown creeper, ruby-crowned kinglet, and an occasional winter wren. I have only once seen the winter wren bathe and it scolded all of the time. The creeper is the busiest bird I have ever seen. It is incessantly on the hunt for its daily bread and must consume an immense amount of insect eggs and larvae. Up to the top of one tree and away to the foot of another, there is always another tree and never time for a bath. It does not relax even to sing; it is noted for its lack of song. I have heard it but once, curiously enough not in the depths of its woodland home, but in a garden on the main street of St. Lambert, during a drizzling rain—a very sweet song that took me some time to locate, owing to the ventriloquial qual-

ity of the creeper's voice and the bark-like appearance of its plumage.

September finishes with an occasional visit from a yellow-bellied sapsucker or blue jay and the arrival of the first batch of slate-colored juncos. The jays never linger long, merely alight on the tops of the elms and away again. These elms offer an attractive resting place for birds of the open country. Once a sparrow hawk perched there; an occasional crow is seen in early morning, and meadowlarks often sing from the tip-top foliage. Red-winged blackbirds, too, sometimes rest there; once I saw one of them bathe.

About the beginning of October bands of restless golden-crowned kinglets visit the apple and cherry trees, as well as the evergreens, while an occasional white-breasted nuthatch prefers to examine the bark of the elms. A little later the black-capped chickadees come and tell me that migration is rapidly waning. Though there are a few finches and others still in the garden, October is essentially a chickadee-kinglet month.

The chickadees are the gleaners that follow in the wake of the earlier hosts of insect hunters. They are always followers rather than leaders. Their progress must need be slow if they would hunt out all of the tiny stages of insects that the others have overlooked in their haste. I sometimes wonder that there is an insect astute enough to hide its progeny from that army of keenly peering eyes. It seems to me that, not only each tree, but each twig and leaf is examined many, many, times.

The hermit thrush is more commonly seen now. On Oct. 13, 1919, at dawn I saw one taking a bath, or rather, I heard him in a varied repertoire as it was scarcely light enough to see him distinctly. First he gave his usual *chuch*, followed by a whistled *pheu*, and then that nasal *n'yea*, that the Wilson's thrush delights in, and finally he sang in an extremely subdued tone. I had not been making a daily practice of arising at dawn but, heartened by hearing the hermit sing, I tried it again the following morning and saw a bird new to the garden, a fox sparrow, having a royal time all to itself in the bath and splashing noisily. At first I thought it another hermit, but the whir of the wings as it splashed spelt fox sparrow, and as it grew lighter I saw it distinctly—the first of this species I had seen in the garden.

Towards the end of October, pine siskins, redpolls, and tree sparrows pay brief visits to the garden, and still later possibly grosbeaks and waxwings, but the bathing season is over. It is cold now and the birds do not feel the need of it. The indomitable song sparrow is still here in small numbers, and a few white-throats, juncoes, and robins, but the bulk has gone.

November is mainly a chickadee month. What other birds there are have mostly retreated to the shelter of the woods.

A list of the birds observed to actually rest in my garden, save two species, the saw-whet and the screech owl, which were plainly heard but not seen, is given below. Those designated by an asterisk used the bath, while several others were content with the spray. I have made no mention of birds seen passing overhead, such as swallows, swifts, nighthawks, and others. The lot on which these notes were made is situated in the town of St. Lambert (opposite Montreal), a quarter of a mile from the river shore. This lot is about one hundred feet square and contains lawn and garden with apple, cherry, ash, maple, elm, cedar and spruce trees. A favorable feature is a thicket of hawthorn and wild cherry in an adjoining lot.

The list follows: sparrow hawk; screech and saw-whet owl; hairy and downy woodpecker; yellow-bellied sapsucker; flicker; ruby-throated hummingbird; *wood peewee; *least flycatcher; *phoebe; kingbird; crow; blue jay; *bronze grackle; *red-winged blackbird; cowbird; *Baltimore oriole; meadowlark; evening grosbeak; pine grosbeak; redpoll; *purple finch; *goldfinch; *domestic sparrow; *song, *white-throated, *white-crowned, *chipping, *fox, and tree sparrows; *slate-colored junco; *black and white, *black-poll, *bay-breasted, *black-throated blue, *black-throated green, *Cape May, *yellow, *yellow palm, *Tennessee, *Nashville, *chestnut-sided, *myrtle, *magnolia, and Canadian warblers; yellow-throat, *redstart, ovenbird, and *water-thrush; *red-eyed, solitary, Philadelphia, and warbling vireos; *catbird; ruby-crowned, and golden-crowned kinglets; *red-breasted, and white-breasted nuthatches; black-capped chickadee; brown-creeper; house, and *winter wrens; *Wilson's, gray-cheeked, *olive-backed, and *hermit thrushes; *robin; and bluebird.

THE RHOPALOCERA, OR BUTTERFLIES, OF HATLEY, STANSTEAD COUNTY, QUEBEC, 1919.

By H. Mousley.

In January of 1840 there was published in London a book entitled, "The Canadian Naturalist," written by P. H. Gosse, who afterwards became a Fellow of the Royal Society, and a well known author of works pertaining to invertebrate zoology. Gosse who was born in 1810, came to reside at Compton, a village some seven miles to the north-east of Hatley in 1835, and remained there for about three years. During that time he wrote the above book, which contains probably the first and only general account of the Rhopalocera and Heterocera of this district.

Of the first named I find there are twenty-five species and forms enumerated in the work. Of this number I have to-day verified twenty-three, besides adding another twenty, thus making a total in all of forty-five to the present day, certainly not a very large proportion of the six hundred or more species to be found in North America, north of the Gulf of Mexico and the Rio Grande. Hatley, therefore, cannot be said to be nearly so rich in butterflies as it is in birds, for of the latter I have already recorded one hundred and seventy-five species, or nearly one quarter of all those known to inhabit the United States and Canada. Before proceeding further, however, it may be well to state that my data regarding the butterflies has been gathered casually during the past nine years, whilst pursuing my favorite study of ornithology, and therefore the list does not profess to be final in any way, but may serve as a basis for further systematic work. Of the nine seasons referred to, the present one (1919) has been by far the most prolific, many species such as the Great Spangled and Silver-spot Fritillaries literally swarming, whilst the Yellow-spot and Tawny-edged skippers appeared in myriads, it being almost impossible to walk anywhere without putting them up in clouds. Apparently a similar state of things existed eighty years ago, for Gosse in his "The Canadian Naturalist," 1840, p. 228, says, "Among the clover blossoms, hundreds of little skippers are dancing in their peculiar jerking way from flower to flower. The Yellow-spot *(Pamphila peckius)* is abundant, and another species much resembling it, the Tawny-edged skipper *(Pamphila cernes)*." Other species such as the Red Admiral, Hunter's Butterfly and most of the Graptas (now genus *Polygonia)*, were more numerous than usual, the hot, and for the most part humid weather of June and July, no doubt, accounting for this extra abundance. In seeming contrast to this profusion, however, might be noticed the unusual scarcity of the Black Swallow-tail, as well as the total absence of the Monarch, both of these species being as a rule fairly plentiful.

The country around Hatley is of an undulating character, the village itself standing at an elevation of 1,000 feet above the sea level, with Lake Massawippi, a fine sheet of water, nine miles in length, and about one mile in width, lying on the western side. It is between this lake and the village, that most of my records have been made, and I know of no species on the eastern side of the village, that cannot be found on the western, although a few are somewhat more abundant on the former side.

Of the nine families of butterflies represented in the United States and Canada, namely, Papilionidæ, Pieridæ, Danaidæ, Satyridæ, Nymphalidæ, Libytheidæ, Riodinidæ, Lycaenidæ and Hesperiidæ, all but two have been found at Hatley, the missing families being Libytheidæ and Riodinidæ.

The Nymphalidæ or "Brush-footed Butterflies," the largest of all the families of butterflies, is also the best represented here with twenty species, then follows the Hesperiidæ or "Skippers," with nine, the Lycaenidæ or "Blues," "Coppers," and "Hair-streaks," with six, and the remaining four families with ten representatives. Most of these species are to be found generally distributed and in fair numbers, but there are some that seem to call for special remarks, and I propose to deal with these, in the order in which they appear in the latest check list.

The black swallow-tail, *Papilio polyxenes* Fabr. In view of the general abundance of this species in most seasons, it is interesting to note what Gosse says about it in his "The Canadian Naturalist," 1840, p. 184: "Another species, the Black Swallow-tail *(Papilio asterius)*, is likewise found in Newfoundland and the Southern States, in both of which I have found it numerous, and I have seen it mentioned in lists of New England insects, yet I have not met with it in this province. I should suppose, however, that it is a native, but probably, as in Newfoundland, only appears plentifully in particular seasons." Considering that Gosse lived three years at Compton, we can only come to the conclusion, that he could hardly have passed it over, if it had been there in those days, for he records another of the same genus, the Tiger Swallow-tail, as being plentiful.

THE CABBAGE BUTTERFLY, *Pieris rapae* Linn. I never go into my garden and see a host of these butterflies flying about the cabbages, without thinking of the halcyon days that must have existed in Gosse's time, for he does not record this greatest of pests, although he mentions the Grey-veined White. Surely the march of civilization brings a trail of evils in its wake!

THE CLOUDED SULPHUR, *Eurymus philodice* Godt. This is a very common and well distributed species, being more plentiful, however, in some seasons, than in others. It is fond of congregating on moist places, especially on roads, where I have seen as many as fifty gathered together so closely, as to be almost touching one another. There are at least two broods, the first appearing in May, and the second in August, my dates for fresh examples ranging from May 15, to as late as Oct. 27. They vary considerably in size, several of the second brood especially, being merely dwarfs, whilst many of the females are albinos, but I have never come across a melanic form of the male as yet.

THE PEARLY EYE, *Enodia portlandia* Fabr. I only came across this species in 1918, and then only two examples were met with, one on July 31, and the other on Sept. 3. In the following year, conditions were evidently similar, for I only saw four examples between July 12 and 17, so that it is evidently an uncommon species here. In "The Canadian Naturalist," Gosse, 1840, p. 246, there is an illustration of it drawn by the author himself, who speaks of it as a rarity here in those days, although plentiful in the Southern States.

THE CLOUDED WOOD-NYMPH, *Cercyonis alope* form *nephele* Kirby. Probably the present exceptionally humid season, may have been responsible for my finding two male examples of this dimorphic variety of *Cercyonis alope*, showing rather more yellow on the fore wings than is quite typical, in fact a mild compromise between *nephele* and *alope*.

HARRIS' CHECKER-SPOT, *Melitaea harrisi* Scud. Of the smaller crescent-spots this apparently is the rarest, there being only one meadow where I have taken it so far, and even there it seems to be very scarce, only one specimen being seen in 1918, and none during the present prolific season of 1919.

NYCTEIS, *Phyciodes nycteis* Dbl. and Hew. As this little butterfly may be mistaken on the wing for *Melitaea harrisi*, with which it is often found flying, it is not so easy to define its exact status here, but so far as my experience goes, I have found it next to Harris' Checker-spot, to be the rarest of the smaller crescent-spots. I only came across one example in 1917, none in 1918, and only five during the present season.

THE VIOLET TIP, *Polygonia interrogationis* Fabr. Of the genus *Polygonia*, this is certainly the rarest species here, for I have only come across it this season (1919), and then only three examples have been noted, as against large numbers of *P. comma* and *P. progne*.

THE GREEN COMMA, *Polygonia faunus* Edw. Of the four Graptas (now genus *Polygonia)* mentioned by Gosse, this is the only one that I have been unable to verify so far, which seems somewhat strange, in view of the fact that the present season (1919), has been an exceptionally good one for the other members of this interesting genus.

THE COMPTON TORTOISE, *Aglais j-album* Bdv. and Lec. This large and handsome butterfly, although having a wide range, is more or less uncommon everywhere, and its numbers at Hatley of late years, seem to be on the decrease if anything, although in July, 1911, it was quite common on the "meadow road" to the east of the village, which at that time was bordered by willow trees (on which the larvæ feed) most of which, however, have since been cut down. Apparently there are two forms of the underside, one dark and the other light, but probably this difference is only sexual, the males being the brighter colored.

HUNTER'S BUTTERFLY, *Vanessa virginiensis* Dru. Until the year 1918, I had always looked upon this handsome butterfly as being particularly scarce here, but during June, August and September, quite a number of specimens were observed, probably owing to its being a good year for the species, the same as 1911 was for *Aglais j-album*. The hot summer of 1919 seems to have suited it also, for its numbers have been even greater than in the previous year. Gosse does not record it in his work, nor yet the still more showy Red Admiral.

THE PAINTED LADY, *Vanessa cardui* Linn. Apparently this is an uncommon, if not a somewhat rare butterfly here, as I have never come across it until the present year (1919), and then only four examples have been noted, one on Aug. 7, and the other three at the end of September.

THE BANDED PURPLE, *Basilarchia arthemis* Dru. This beautiful butterfly is fairly well distributed, and may be found from about June 11 to the middle of July, although I have seen worn specimens at the end of the latter month. Gosse in "The Canadian Naturalist," 1840, p. 306, however, records an example as late as September 4, which he concludes was only an occasional straggler, or one of an unusual late hatching.

THE VICEROY, *Basilarchia archippus* Cram. This handsome butterfly mimics the Monarch *(Danaus archippus* Fab.), and is one of the most striking cases of mimicry, which occurs in our fauna. It is by no

means plentiful here, only very few examples having been met with each season, and these for the most part on the roadside. During the present exceptional season (1919), I have only seen it once, on Aug. 7.

THE ACADIAN HAIR-STREAK, *Strymon acadica* Edw. Prior to the present year (1919) this was the only hair-streak I had met with at Hatley. I first found it in 1914 on the roadside, about two miles to the south of the village, but only in very limited numbers. From that date onwards I lost sight of it until July of the present year (1919), when I found it again in the same locality, but in rather increased numbers.

THE STRIPED HAIR-STREAK, *Strymon liparops* Bdv. and Lec. This is generally considered a somewhat rare little butterfly wherever it occurs, which remark is certainly true of it at Hatley, for I have never seen it until the present season (1919), and then only in two or three places, along the same roadside that the Acadian Hair-streak frequented. The two species were flying together, from about July 9-14 in about equal limited numbers.

THE WANDERER, *Feniseca tarquinius* Fabr. This apparently is another rare little butterfly here, for I have only come across two specimens of it so far, one on June 8, 1917, and the other on May 25, 1918. Only one species of the genus is known. While it is true that almost all the larvae of lepidoptera subsist upon vegetable food, nevertheless there are exceptions, one of which is the present species, whose slug-like larvae feed upon the woolly aphid of the alder.

THE SPRING AZURE, *Lycaenopsis pseudargiolus* form *marginata* Edw. Prior to the spring of 1919, I had only come across the form *marginata*, of this very polymorphic species, although Gosse in "The Canadian Naturalist," 1840, p. 123, speaks of it as *Polyommatus lucia*, by which it might be assumed he refers to the form *lucia* Kirby, and was unacquainted with *marginata*. Both *lucia* and *marginata* are winter forms, coming from chrysalids which have lived through the winter and are the first to appear in early spring. As already indicated, I have found *marginata* to be by far the commonest form, two examples only of *lucia* having been taken in May of the present year, 1919.

THE BLACK SKIPPER *(Thymele brizo?)* This name was used by Gosse on page 184 of his work. The reference may possibly be referable to the Sleepy Dusky-wing *(Thanaos brizo* Bdv. and Lec.), although the note of interrogation might allow of its being placed under *Thanaos icelus* Lint., (The Dreamy Dusk-wing), which latter I have found to be not uncommon here, whereas *brizo* is out of its habitat.

THE ARCTIC SKIPPER, *Carterocephalus palaemon* Pall. This little skipper, which is totally unlike any other species in the fauna, is described by Gosse in "The Canadian Naturalist," 1840, p. 219, as very rare near Compton, and I had held a similar view regarding it at Hatley, until June 4, 1918, when I first came across it in an open space in the centre of a little swampy wood, about a mile or rather more, to the north of the village. Later on I found it in some marshy ground, adjoining the meadow road to the east of the village, and in several other places as well. It seems strange I should never have come across it before, unless the above year was an exceptional one for the species, which I think it must have been, seeing that I have failed to come across it again during the present season (1919), (which might be described as a "skipper" year), when all the other members of the family have been unusually abundant.

THE LONG-DASH, *Polites mystic* Scud. So far I am unable to say very much about this skipper, having only come across it for the first time during the present season (1919). In point of numbers, however, it was nothing to be compared with those of the smaller members of the genus, such as the Yellow-spot and Tawney-edged skippers, besides which its distribution seemed much more restricted.

THE DUN SKIPPER, *Euphyes vestris* Bdv. This is another skipper whose presence was undetected until the present year, and looking to the general difficulty of capture, and identification in the field, I think this family probably offers more scope for additions to the Hatley list, than any other. As with the Long-dash, I am unable to say very much about its status, except that its distribution was more restricted, and numbers even less, than those of the former.

Possibly the remark in my paper on the Orchids of Hatley (OTTAWA NATURALIST, Vol. XXXII, 1919, No. 8, pp. 144-147) that the possibilities of the place had only been touched upon, so far as regards those lovely flowers, may apply equally well here to the butterflies, and that before long others will be found able and willing to extend the following list, the nomenclature of which is the same as that used by Barnes and McDunnough in their Check List of the Lepidoptera of Boreal America.

LIST OF THE BUTTERFLIES OF HATLEY, 1919.

PAPILIONIDAE.

*The Black Swallow-tail, *Papilio polyxenes* Fabr.
The Tiger Swallow-tail, *Papilio glaucus canadensis* R. and J.

PIERIDAE.

The Grey-veined White, *Pieris napi* Linn.
*The Cabbage Butterfly, *Pieris rapae* Linn.
The Clouded Sulphur, *Eurymus philodice* Godt.

DANAIDAE.

The Monarch, *Danaus archippus* Fabr.

SATYRIDAE.

The Pearly Eye, *Enodia portlandia* Fabr.
*The Little Wood-satyr, *Cissio eurytus* Fabr.
The Eyed Brown, *Satyrodes canthus* Linn.
*The Clouded Wood-nymph, *Cercyonis alope* form *nephele* Kirby.

NYMPHALIDAE.

The Great Spangled Fritillary, *Argynnis cybele* Fabr.
The Silver-spot Fritillary, *Argynnis aphrodite* Fabr.
The Silver Bordered Fritillary, *Brenthis myrina* Cram.
*Meadow Fritillary, *Brenthis bellona* Fabr.
The Baltimore, *Euphydyras phaeton* Dru.
*Harris' Checker-spot, *Melitaea harrisi* Scud.
*Nycteis, *Phyciodes nycteis* Dbl. and Hew.
The Pearl Crescent, *Phyciodes tharos* Dru.
The Violet Tip, *Polygonia interrogationis* Fabr.
Hop-merchant, *Polygonia comma* form *dryas* Edw.
**The Green Comma, *Polygonia faunus* Edw.
The Gray Comma, *Polygonia progne* Cram.
The Compton Tortoise, *Aglais j-album* Bdv. and Lec.
The American Tortoise-shell, *Aglais milberti* Godt.
The Mourning Cloak, *Aglais antiopa* Linn.
*The Red Admiral, *Vanessa atalanta* Linn.
*Hunter's Butterfly, *Vanessa virginiensis* Dru.
*The Painted Lady, *Vanessa cardui* Linn.
The Banded Purple, *Basilarchia arthemis* Dru.
*The Viceroy, *Basilarchia archippus* Cram.

LYCAENIDAE.

*The Acadian Hair-streak, *Strymon acadica* Edw.
*The Striped Hair-streak, *Strymon liparops* Bdv. and Lec.
*The Wanderer, *Feniseca arquinius* Fabr.
The American Copper, *Heodes hypophlaeas* Bdv.
The Spring Azure, *Lycaenopsis pseudargiolus* form *marginata* Edw.* and form *lucia* Kirby.

HESPERIIDAE.

*The Northern Dusky-wing, *Cocceius pylades* Scud.
*The Dreamy Dusky-wing, *Thanaos icelus* Lint.
**The Black Skipper *(Thymele brizo?)*
The Arctic Skipper, *Carterocephalus palaemon* Pall.
The Tawny-edged Skipper, *Polites cernes* Bdv. and Lec.
*The Long-dash, *Polites mystic* Scud.
The Yellow Spot, *Polites peckius* Kirby.
*The Hobomok Skipper, *Poanes hobomok* Harris.
*The Dun Skipper, *Euphyes vestris* Bdv.

*Not recorded by Gosse.
**Recorded by Gosse but not yet verified.

A RARE FUNGUS NEW TO CANADA

By W. S. ODELL.

While collecting fungi in the vicinity of Ottawa during the past year, for the Victoria Memorial Museum, one of the earliest forms found was the edible morel, *Morchella esculenta* Pers. Shortly after snow had left the ground and before leaves appeared on the trees and shrubs, its dark olive green or brownish cone was seen protruding a few inches above ground. It is fairly common, growing usually in damp situations, and lasts during May and part of June if the weather is favorable. Anyone who has seen this peculiar fungus w. remember and readily recognize it. It belongs to the order Ascomycetes, family Helvellaceae, and differs from mushrooms, puff balls, etc., in the manner in which its spores are borne. In mushrooms the reproductive bodies called spores, are borne, four in number, on ends of club-shaped bodies called basidia, covering both sides of the gills. The spores which are the seeds of the mushroom, are of various sizes; they are microscopic, but may be seen en masse by placing a specimen on black paper, tightly covered with a glass jar to prevent air currents. After a few hours the paper will be covered with a whitish deposit, which consists of spores in inconceivable numbers. Spores are dispersed by the wind; some fall to the ground, and in process of time, it may be months, often years, produce under proper conditions, tiny thread-like jointed strands called "spawn" by gardeners, which grow through the substance on which the plant feeds. A familiar form occurs in white mould often seen on vegetables or on bread, and is better known as mycelium. It may be found by digging up young mushrooms or under matted leaves or in much decayed logs in the woods, permeating every part. In fact the mycelium is mainly responsible for the rapid decay of wood, and causes much loss annually to standing timber.

While in the form of threads mycelium is the vegetative stage of the mushroom. When the fruiting stage begins, small knobs appear on these strands, minute at first, varying from the size of a pinhead



Fig. 1. Morchella esculenta; 2. Morchella esculenta, section; 3. Morchella bispora. 4. Morchella bispora, showing partitions (P); 5. Morchella bispora, showing mycelium (M).

to that of a pea, growing larger all the while, making their way to the surface of the ground, when if conditions are favorable mushrooms will mature in a short time.

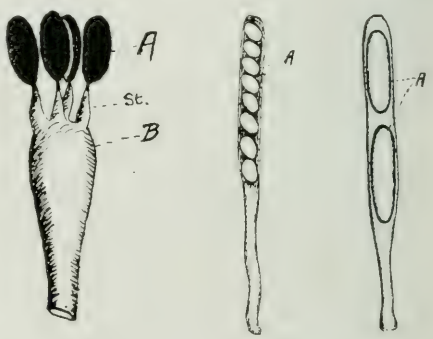
The cap or pileus of a mushroom is the expanded part; on its under side are gills or lamellae, thin plates radiating from the stem to margin of the pileus, affording a foundation on which club-shaped cells stand parallel to each other. The entire surface of the lamellae is covered with these cells, called basidia.

In Ascomycetes, including morels, the distinctive feature consists of spores enclosed in a long cylindrical tube or ascus. Like mushrooms, morels consist of two prominent parts, stem or stipe, and cap or pileus; but are very unlike them in general appearance. The pileus varies much in form being conical, ovate, rounded, bell-shaped, or cylindrical, and is always pitted. These depressions are usually regular, covering the entire outer surface, and are separated from each other by ridges with rounded blunt edges, thus forming a network assuming a honeycombed appearance.

Unlike mushrooms, the upper or exterior surface is the spore bearing part in morels, and spore sacs are developed on both ridges and depressions. The pileus is hollow, closed at the apex, and attached throughout its length to the sides of the stipe. In color it varies from shades of olive, to greenish brown, and light ochre yellow. Its stipe is hollow and continuous with the cavity of the pileus. It is stout, smooth, but covered with minute granular particles, and varies from ½ to 1 inch in diameter. Its spores as before mentioned contained in an ascus, are smooth, hyaline, elliptical, standing obliquely, eight in a continuous row, varying in size from 19 to 22 microns long by 11 microns wide. The plant is from 2 to 4 inches high, but is often found larger.

The rare species referred to in the title of this article, namely *Morchella bispora* Sor., or the Two-spored morel, is a morel somewhat similar to the one described, but unlike it in several distinctive characteristics. Its surface is reticulated, with ridges running in a more regular longitudinal manner, and differs in having its pileus free from stipe along lower margin, but is attached to it at its apex. Its main difference, however, lies in the fact that its ascus contains only two exceedingly long spores, while all other morels have eight. The pileus is dark greenish brown in color, 1 to 1½ inches long by 1 to 1¾ inches wide. Its stipe is stuffed with a pithy substance, at intervals of one-half inch, forming partitions, leaving hollow spaces between. It is cylindrical, very fragile, tapering to apex, straight, often slightly curved, easily separating from pileus, having base covered with a thick floccose substance readily rubbed off. In size it is from 4 to 5 inches long, and from ½ to ¾ of an inch thick, at widest part. Its spores are cream or light yellow, faintly granular, two in an ascus, often slightly curved, fairly uniform in width, exceedingly variable in length. They are narrowly-oblong, size 52-62 microns long by 14 to 17 microns wide.

Morchella bispora grows singly, under open hardwood trees, in rocky soil, among leaves; height from 4 to 6 inches. A few plants were found in Gilmour's grove, Chelsea, Que.; two in Armstrong's bush near Green's creek, and six in Billings' bush, both of these latter localities being in the province of Ontario, near Ottawa. After May 15, no more specimens were seen. Possibly if the surrounding woods were systematically searched in early spring, the range of its habitat might be extended. Considerable interest is attached to this species partly on account of its rarity, but mainly



6 7 8

Fig. 6, Basidium of Coprinus comatus (A, spores; st., sterigmata; B, basidium); 7, ascus of Morchella esculenta (A, spores); 8, ascus of Morchella bispora (A, spores). All highly magnified.

because there is no record of its having been previously found in Canada.

All morels are edible, and in the writer's estimation surpass all other kinds of mushrooms, as a choice article of diet. They are not found in large numbers in the district of Ottawa, but are general around suburbs of the city in such places as the edges of woods, in grass, and in shady places. They have been found at Rockcliffe, at the Rifle Range, Experimental Farm, High Bridge over Rideau river, Wychwood, Lake Flora, and in the woods south of Lemay's lake.

There seems to be a popular misconception regarding the food value of mushrooms. From articles appearing in newspapers, one would be led to infer that their food value is high—that they could take the place of our staple foods, wheat, beans, flour or meat. Investigation proves that their edible value is not so high as is supposed. Careful analyses have been made of many species, and while there is con-

siderable variation in composition, the average is 85 to 90 per cent water and 10 per cent solid matter. In *Morchella esculenta* it is 89.54 per cent water, 10.46 solid matter; in the cultivated mushroom, *Agaricus campestris*, 91.8 per cent water, 8.2 per cent solid matter. This would place them on a par with cabbages and turnips, which are not generally considered as being highly nutritious.

Large quantities of edible mushrooms go to waste every summer. This is to be regretted since they are easily accessible. While some mushrooms have an indifferent taste, most are of fine flavor, and would repay the trouble taken in collecting them. If their value as a delicacy were more generally known, sufficient numbers could be found all through summer, at the cost of a little exertion, to furnish an appetizing relish for many a meal.

Thanks are due to the late Mr. J. M. Macoun, Botanist of the Victoria Memorial Museum, for the photographs from which the accompanying plate has been made and to Prof. John Dearness, London, Ont., for identification of specimens.

A FABLE OF TO-DAY.

By Ralf Ranger.

Once upon a time there was an Old Naturalist. He was quite a good Old Naturalist too, and if you look in many of the books you will find many observations and the results of interesting and important investigations credited to him, and not a few monographs bear his name as author.

After some further years of work this Old Naturalist was about to write a book dealing with a good many different forms of animal life. One day he went up to a big museum and introduced himself to Mr. Flittin Nomen, the young expert in charge of the ornithological section.

"Ah, yes, sir," said Mr. Flittin Nomen, "I am extremely glad to meet you. I have always admired your monograph on *Planesticus migratorius*."

"Pardon me, but I could not have been the author of the work you refer to. I do not even know the species of which you speak."

"Yes, yes, but I mean your monograph on the American Robin."

"Oh, the American Robin. But is not the name *Merula migratoria?*"

"It has not been called *Merula migratoria* for a long, long time, for four years at the very least," said Mr. Flittin Nomen. "Your account of the habits of *Dendroica fusca*, too, I have always held in very high esteem."

"*Dendroica fusca?* I thought that I knew the genus *Dendroica* pretty well, but I know of no such species."

"It used to be called *Dendroica blackburniae*, but not for a long time, not for the last three years certainly. And you know," said Mr. Flittin Nomen, his eyes brightening, "it is really not worth your while learning the name *fusca* for this species, for I have recently made a great discovery—I have found that the specific name *alba* really has priority. That is the name used in the work published a week before the publication of *fusca* and consequently—"

"But this species is not *white*" exclaimed the Old Naturalist.

"Oh, that doesn't matter a bit, *alba* has priority by a *whole week*—think of that! It took me a long time, and much very careful research, to make sure of the exact week of publication of the two works, but I have confirmed it, and am proud to say that I have thus been able to make a very valuable contribution to science. I know that in the old days it was supposed that a scientific name should be in some degree descriptive of the species, or at least should not be entirely misleading in its significance, but that idea is now entirely out of fashion. *Alba* is undoubtedly a lapsus calmi, but that doesn't matter either, it has priority, and *that's the thing*."

"But is there no such thing as a nomen conservenda, thus allowing a name which has become thoroughly established to remain?"

"I believe there used to be, in ancient times, but such absurd ideas are entirely out of date."

The Old Naturalist turned to go.

"So very glad to have met you," said Mr. Flittin Nomen," and I can give you a bit of advance information. I believe that I can prove that *Melospiza* is untenable for the Song Sparrows, and it should be *Rubraspizella*. It's really a very good job too, for they have been *Melospiza* long enough."

"Truly, 'the letter of the law and not the spirit'," murmured the Old Naturalist as he wandered off in the direction of the entomological section.

In the entomological section the Old Naturalist met the expert in charge, Dr. Changem Offen, and tried to converse with him, but as all the names the Old Naturalist used had to be dug up in a list of synonyms, there was little time left for discussion of life-histories, habits, habitats, economic status, and other points in which the Old Naturalist was interested, but which Dr. Changem Offen seemed to regard as of very secondary importance.

The Old Naturalist wandered on to the mammalogical section. Here he found the curator contemplating a tray of skins of the genus *Microtus*, while on the table lay a single specimen. After introducing himself, he enquired as to the identity of the specimen on the table.

"I don't know what it is," said the curator. "In fact, I am afraid it is impossible to say. You see it has lost its label, and without the locality I am entirely unable to say to what subspecies it belongs."

"But, if you cannot tell what it is without a locality label, it can hardly be worth bothering about," said the Old Naturalist.

"Oh, yes, indeed yes. That's not the point at all. If any two mammals come from different localities they *must* belong to different subspecies, whether we can see the differences or not, and we're all right, quite all right, as long as we have the labels."

"I thought that subspecies were named to facilitate reference, caused by climatic conditions, and that their chief interest lay in correlating these differences with the conditions under which they were produced."

"That, I know, used to be the old idea, but we have got far beyond that now, and we know that subspecies exist for each locality. It is a great improvement on the old method and quite simple as long as we have the labels."

The Old Naturalist left the curator hunting for his lost label, and proceeded to the botanical section. Here he introduced himself to Dr. Synn O'Nymm Seeker, Chief Taxonomist of the Order Rosales.

"I used at one time," said the Old Naturalist, "to be interested in the genus Crataegus. What is the situation in that genus at the present time?"

"The genus Crataegus?" exclaimed Dr. Synn O'Nymm Seeker, "why my dear sir, there is no such genus. It was discovered long ago that each of the old species of that so-called genus was really a separate genus, and that each of these separate genera had from fifty to a hundred species. But even this point of view is now obsolete, as Professor Splittem Finer has just found that every individual hawthorn is a distinct species and he is now engaged in the momentous task of going over the whole of North America tagging every tree with its own specific name."

The Old Naturalist turned sadly away. Poor old out-of-date chap! He returned to his home, spent the rest of his life in trying to catch up with a synonomy which got away from him in one group while he was working at another, and in trying in vain to find some rhyme or reason in the mass of published subspecies. So he wore himself out and died—and never wrote his book.

I remember the Old Naturalist well. He was a good worker and a progressive. He would have done even more practical field work if his time had not been so largely taken up in controversy with the conservatives of his day. However, we owe him a larger debt of gratitude than is generally realized. It was largely due to him a code of nomenclature was established which ended the existing practice whereby each individual crank was a law unto himself, the confusions from which we are only just straightening out to-day. He had a caustic pen too. His papers on *Turdus* vs. *Merula* in the old numbers of Ornithologica are classics of sarcasm and irony, and well worth occasional re-reading.

P. A. T.

NOTES ON THE NESTING HABITS AND FOOD OF PRAIRIE HORNED-LARKS IN MANITOBA.

By Norman Criddle, Treesbank, Man.

The notes presented below are largely from observations made during the spring of 1918, and owe their origin to the fact that I was unable, at that time, owing to ill-health, to devote my attention to the more strenuous work which usually falls to the lot of a field officer of the Dominion entomological service. As it happened, the horned-larks were nesting close at hand and, therefore, presented opportunity for study without fatigue to the observer.

The horned-larks of Manitoba have already been dealt with in this journal,* but as the present notes add to what was previously written they seem worthy of record here.

Prairie horned-larks are the first birds to return to their summer homes from the south; they are usually with us in numbers by March 1 and at the end of that month are, as a rule, busily engaged in incubating a clutch of eggs. My 1918 records read somewhat as follows: April 18, young birds almost able to fly; April 30, young flying; May 3, nest with 3 eggs; young from this nest left on May 26. May 16, nest with 4 eggs, young hatched May 26 and left the nest June 4. On June 7, a nest with 4 eggs was discovered and on July 2 one

*Ottawa Naturalist, Vol. XXX, No. 11, Feb. 1917.

with 2 fresh eggs. On July 14 still another nest was located, this one having 4 eggs. At this last date males were singing everywhere and the time was undoubtedly one of general breeding. From these records it will be seen that there is a nesting period of at least four months, also that the birds rear three and perhaps four broods in a season. It is interesting to relate that while the birds do not, as a general rule, rear two families in the same nest, one pair did so, while another couple built a second nest within a few feet of the first. One nest, under close observation, contained young which left it in nine days after hatching, and though they were still unable to fly at that time they had, nevertheless, acquired considerable feathering. The nest to which I devoted most attention was situated quite close to the house and within easy vision from a window; it was built among chips and sunken, as usual, in the ground, the locality being one frequented by humans as well as by dogs and poultry. When either of the first two drew near, the brooding bird slipped quietly from the nest, apparently trusting to the color similarity of the young and the nest to the surroundings to keep them from harm, but when a hen came within reach the small bird flew at her with such vigor as to cause the hen to become seriously alarmed and make her leave in a hurry.

The young birds were attended by both parents from the time they were hatched until they left the nest and both adults took an equal share in feeding their offspring, as well as cleaning the nest. As it began to grow dark the female fitted herself over the young for the night while the male after singing in the twilight went to rest in the vicinity.

Judging from the observations made in 1918, it would seem that the food of young prairie horned-larks consists very largely of cutworms which the parent birds dig out of the ground by aid of their beaks. The locating of these insects is performed with remarkable accuracy though it is due to a knowledge of the insects' haunts rather than to a perception of the exact situation in which they rest. Thus, parent horned-larks were seen, repeatedly, searching around clumps of weeds which were more or less isolated through being surrounded by bare spots, these being the situations which our observation have shown are most frequented by cutworms. The time occupied in securing one of those insects naturally varied, but on an average required rather less than four minutes. A pair of birds watched on June 4, feeding young a week old, and commencing at sunset, visited the nest with food on an average every two minutes. Judging from these and other observations we can, therefore, estimate the total number of cutworms consumed in a day at fully 400; in other words, nearly 3,000 a week, and this does not take into consideration the number of insects eaten by the adults which would add considerably to the total.

Cutworm hunting is naturally a daylight occupation and since it continues until dark there is every reason to suspect that it commences soon after dawn, especially as the male birds begin to sing at the first indication of returning day. The birds I had under observation abandoned their work as the day grew dark.

A few mornings after the records mentioned above were taken, I found the young still in position in the nest, but at 8 a.m. the largest and oldest nestling followed its mother away and was soon after lost in the herbage, neither birds being seen again. The male continued to feed the remaining two until five minutes after nine, when the next largest followed him away. The third nestling was smaller than the others and I fully expected that it would be left to perish as often happens when food is scarce. For a time the male continued to devote all his attention to the one that had followed him but eventually he returned to the nest with a cutworm and shortly after with yet another. Feeling sorry for the hard worked little bird I placed five full sized cutworms on the edge of the nest and then awaited developments. The male soon returned with the usual fare, and then spying the insects placed near, he stuffed four of them in succession down the throat of his greedy charge, taking the last grub to the other bird. He continued to labor on behalf of both young until shortly after eleven o'clock when the remaining nestling followed him away.

The habit of the male bird continuing to support both young after the female had evidently deserted them is naturally a very important characteristic providing it is one that is generally followed. The question remains, would he have attempted to do so had food been scarce? The evidence is in the negative. It is common knowledge to those who have studied horned-larks that they seldom rear more than one of the first brood, the reason for this is apparently the scarcity of insect food at that time, especially the scarcity of cutworms. During June cutworms are at the height of their season and, therefore, the birds find little difficulty in rearing the full allotment of young. July is also a favorable month owing to the presence of locusts and caterpillars of various kinds.

The food of adult horned-larks is less insectivorous than is that of the young and is at least in part made up of seeds and sprouted plants of various kinds, but from the fact that enormous flocks of these birds sometimes continue on the grain fields for two or three weeks in spring time without doing

any appreciable harm we must conclude that they are either eating weed seeds or insects. We know that before the spring really opened that horned-larks partook daily of the weed seeds placed for them. This is doubtless why they became tame and later nested nearby. We have also seen them repeatedly devour cutworms during the nesting season so that the evidence of their usefulness seems to be without question.

BRIEF REPORT OF THE OTTAWA FIELD-NATURALISTS' CLUB FOR THE YEAR ENDING DECEMBER 2, 1919.

At the March, 1919, annual meeting of the Ottawa Field-Naturalists' Club, the constitution was amended to make the club year coincide with the calendar year, and, therefore, each future volume of the club publication will cover one calendar year instead of parts of two as in the past. In spite of the fact that owing to this change in the constitution, the past year—the fortieth of the existence of the Ottawa Field-Naturalists' Club, covering a period of only nine months—was the most successful in the recent history of the society, which now has a membership of 644, or more than double that of 1917.

The club activities are directed toward the popularizing and the diffusing of knowledge of the natural sciences, and are carried on in three chief ways: a course of lectures, two series of field excursions, and the publication of THE CANADIAN FIELD-NATURALIST.

Owing to the short year the lecture programme was not begun prior to the annual meeting. A list of thirty-six lectures to be given by club members has been sent to local societies, clubs, churches and schools from which they may select and request desirable talks.

The eight field excursions were well patronized, the average attendance being 23. Scientific men attended the excursions to direct interest and answer questions.

THE CANADIAN FIELD-NATURALIST, the official organ of the club which has completed its thirty-third volume, is also now being used as a medium of publication by the four affiliated societies listed on the cover.

At a recent meeting the council was informed that Mr. R. B. White had bequeathed the club one hundred dollars per year, which will be allowed to accumulate along with other funds in trust to form the nucleus of a trust fund the interest of which will eventually be used to promote natural history research work in Canada.

The officers and committee for the year 1920 are as follows:

President, M. Y. Williams; Vice-Presidents, L. D. Burling, R. M. Anderson; Secretary, Clyde L. Patch; Treasurer, Miss E. B. Crampe; Editor, Arthur Gibson.

Additional members of Council: Hoyes Lloyd, W. T. Macoun, G. A. Miller, Miss M. E. Cowan, C. B. Hutchings, C. M. Sternberg, H. I. Smith, P. A. Taverner, E. Sapir, F. W. Waugh, E. M. Kindle, W. J. Wintemberg, R. E. DeLury, F. Johansen.

STANDING COMMITTEES OF COUNCIL.

Publications—Clyde L. Patch, A. Gibson, L. D. Burling, H. Lloyd, F. Johansen.

Excursions—F. W. Waugh, C. M. Sternberg, G .A. Miller, Miss M. E. Cowan, C. L. Patch, C. B. Hutchings, W. T. Macoun, H. Lloyd, F. Johansen.

Lectures—R. M. Anderson, P. A. Taverner, L. D. Burling, W. T. Macoun, G. A. Millar.

Trust Funds—W. T. Macoun, C. Gordon Hewitt, H. M. Ami.

Auditors—J. Ballantyne, E. C. Wight.

LEADERS AT EXCURSIONS.

Archaeology—Harlan I. Smith, F. W. Waugh, W. J. Wintemberg, Dr. C. M. Barbeau, Dr. E. Sapir.

Botany—G. A. Millar, W. T. Macoun, Mrs. A. F. Brown, Dr. M. O. Malte, J. R. Dymond, E. C. Wight, Miss M. E. Cowan.

Entomology—C. B. Hutchings, Arthur Gibson, J. M. Swaine, F. W. L. Sladen, Miss Crampe.

Geology—Dr. E. M. Kindle, Dr. M. Y. Williams, H. McGillivray, L. D. Burling, E. Poitevin, Dr. M. E. Wilson.

Ornithology—P. A. Taverner, C. L. Patch, Dr. M. Y. Williams, A. G. Kingston, Hoyes Lloyd.

Zoology—Dr. R. M. Anderson, A. Halkett, C. L. Patch, E. A. LeSueur, C. H. Young, C. E. Johnson.

Photography—W. S. Hutton.

NOTES AND OBSERVATIONS

THE YELLOW-THROATED VIREO NEAR SEELEY'S BAY.—This bird is usually looked on as rather southern in Ontario, and I was a little surprised to hear its well-known and easily distinguished song in the woods near Seeley's Bay while motoring to Ottawa on July 3, 1919. On looking up the records I find that there are many reports of its occurrence in eastern Ontario, but that observed on the above date is the first one that I remember to have seen myself, and perhaps the occurrence is worthy of record.

W. E. SAUNDERS.

A NEW MAMMAL FOR CANADA.—In the summer of 1890 the writer, with Dr. F. A. Saunders, was collecting mammals at Ottawa, and among others we were after bats. On the evening of July 10, we took in "Clarke's woods," immediately northwest of the Observatory gate of the Experimental Farm, a little brown bat, and unfortunately, we managed to lose the skull. Recently, I was sending some specimens for identification to Washington, and decided that the little bat was sufficiently different to be identified without the skull, so I included it.

The answer comes back that it is the Pipistrelle, *Pipistrellus subflavus*, and the first to be taken in Canada. It does not differ from the specimens taken in New York state near Lake George, and that general region, the only source of records up to the present.

This bat may now be looked for in all the territory between Ottawa and the St. Lawrence, and ought to be found at Montreal.

The little known bats are near enough alike to be a moderate puzzle to those who do not know them, but most species can be readily picked out by the initiated. We have in Ontario *Eptesicus fuscus, Myotis subulatus, M. lucifugus,* and probably *Nycticejus humeralis*, besides the additional species noted above.

W. E. SAUNDERS.

PHENACOMYS INTERMEDIUS FROM HIGH RIVER, ALBERTA.—Among a small number of mammals sent to Washington for identification, one is returned with the above label. I have been hunting for specimens of this genus for years, and it is a sad commentary on one's acuteness to find that an example has been taken and remained unrecognized!

It was with a lot of *Microtus* living in a shrubby valley, and is really remarkably like some members of the other genus taken there and in the nearby regions. When I showed the specimen to a noted mammalogist he said at once that he recognized *Phenacomys* roughly by the long thick fur, but immediately he found that *Microtus drummondi* from the same locality was indistinguishable. The root characters of the teeth turn out to belong to very old individuals only, and this leaves the younger, though fully grown adults, in the class of "very difficult to identify."

The tail is short, but so are tails of *Microtus* found alongside. To illustrate the difficulty the following measurements are of several specimens:

			Length.	Tail.
854	Phenacomys		123	27
882	Microtus	minor	118	26
880	"	drummondi	126	35
884	"	minor	127	29
885	"	"	127	29

W. E. SAUNDERS.

BREWER'S SPARROW IN SASKATCHEWAN AND ALBERTA.—In a recent issue of the *Condor*, there is a record of the occurrence of this sparrow in Alberta, and it is given as the first record for the province. When I looked it up in Macoun's Birds of Canada, I was surprised to find that the claim is correct. My impression had been that it was fairly well known and widespread near the Alberta-Saskatchewan line, but in this I was mistaken. Moreover, I find that I have failed to find it three times when on what might be considered to be favorable ground in those provinces, namely, at Gull Lake, Sask.; High River, Alta., and Dunmore, Alta. On Sept. 1, 1896, I took a specimen, my first, at Maple Creek, Alta., and my records do not show any others observed on that day. I did not meet with it again until June 9, 1906, when my train was delightfully held up all day at Cummings, in the dry region of Saskatchewan, owing to a "washout." The other passengers fretted, but to me it was a great chance. In my wanderings through the muddy plains that day, I found two nests of Brewer's sparrow and took two male birds, and heard and saw many others. These are now in my collection and measure 138, 64, 56, 18 and 140, 65, 61, 17.

These birds were inhabiting a sage brush country, and the nests were in sage at about a foot from the ground. They resembled those of the field and chipping sparrows, and the eggs are of the same type.

W. E. SAUNDERS.

PUSS IN A SPARROW CHASE.—Our family cat doubtless has figured in other sparrow chases—of her own instituting, but I want here to introduce her as a star actor in a real humanly-conducted chase, such as the boys in some communities at least, are all familiar with.

As everyone knows, the noisy, quarrelsome, hungry, dirty, little English or house sparrow becomes an intolerably numerous and annoying nuisance at times. To keep him within some sort of bounds, shooting, poisoning, and other means must be employed, and as I have intimated, these various measures may be applied in concert by a whole community. A sparrow chase is ordinarily launched by the choosing of sides, usually in the winter season, when other birds are out of harm's way.

On one ocasion Puss entertained us to some rather extraordinary behaviour, and set us wondering just what goes on in the mind of a mere cat. When our quest of sparrows one night, took us up into the barn, we found Puss there ahead of us on a like errand, experience having taught her that occasional stragglers might be had for the taking. Being an old pet, our proceedings did not disturb her much, and she looked on quietly, until presently escaping sparrows, blundering about the mows, aroused her interest. In the fitful light of our lanterns the birds would sometimes find new roosting places under the roof, but as often as not they would settle where quite accessible to us, or the cat. The latter was quick to see her advantage, and would spring after a passing sparrow, or marking its course, would pick her way along the framework or across mows, to reach its new resting-place. She was soon fairly beside herself over the novelty of the situation; at least that is how we charitably accounted for some of her eccentric doings. Time and again on capturing a bird, she hurried directly to us, and dropping it at our feet, proceeded to divide her attention between jealously guarding her precious booty, and rubbing herself furiously about our legs. Evidently she knew she "hadn't ought to" trust us humans so far, and yet she was consumed with a desire to manifest her delight, and we were the only beings about to show any adequate appreciation of her magnificent prowess. We surely did lionize her, seeking in so doing to hold her attention sufficiently to enable us to appropriate the sparrow's head before she should take the notion to eat it. The head was all we wanted, but when we feared her appetite might begin to fail, we deftly slipped an occasional bird out of sight, and took care to get her interested in the chase again as quickly as possible. For several nights the comedy was repeated, Puss retaining her inordinate vanity, or whatever we call it, to the end of our operations in this barn. Once in a while, through a lurking suspicion of us, or some other whim of her own, she was ready to ignore us, and make a meal of her capture by herself, but usually coaxing was effective, when her own motives would not have brought her.

I have thought it worth while to record this, because, while a cat with a bird or mouse will often show a certain degree of friendliness, I have never seen or heard of anything to compare with this demonstration. On a couple of occasions I have known a cat with young kittens to behave in a somewhat similar manner. After keeping them carefuly secreted for a time, she one day displays unusual attachment to a human friend, persisting in her attentions until she succeeds in drawing him, with evident purpose, to their hiding place—another instance, it would seem, of some overwhelming hunger after human sympathy or commendation, which domestication has placed there.

HERBERT GROH.

ALBERTA NATURAL HISTORY SOCIETY.—The 14th annual meeting of the society was held at Red Deer, on Friday, Nov. 28, 1919.

At the afternoon session the usual business was transacted, including the reading and passing upon of the report and financial statement of the secretary-treasurer, and the election of officers for the ensuing year, viz: Hon. President, Hon. D. Marshall; Hon. Vice-President, Mr. J. J. Gaetz, M. P. P.; Second Vice-President Mr. H. A. Craig; President, Mr. F. C. Whitehouse; Vice-President, Mrs. W. A. Cassels; Second Vice-President, Dr. H. George; Directors, Mrs. George, Mrs. Pamley, Mrs. Root, Mr. E. Wilton, Mr. C. H. Snell, Mr. W. F. Harris; Edmonton, Messrs. K. Bowman, F. S. Carr, D. Mackie.

At the evening session the following papers were read: The executive report, Mrs. Cassels; Annual entomological report, dealing with insect pests, Mr. Whitehouse; The crow family, Dr. George, illustrated with specimens and eggs; Birds of Flagstaff, Alberta, Mr. Fleming, of the University staff, Edmonton.

During the year the following papers were given:

Feb. 31—Notes of a survey tour down Peace river and through the Peace Delta, 1916, Mr. C. H. Snell.

March 28—Butterflies of Alberta, demonstrating

the use of a mirroscope for showing specimens, Mr. F. C. Whitehouse.

Sept. 26—Edible fungi, Mrs. Powell.

In Januáry a meeting was held at Wetaskiwin and special papers were given by members from Red Deer.

The Society's publication of "Dragonflies (Odonata) of Alberta" by F. C. Whitehouse, 1918, was followed this year with "Annotated Check List of the Macrolepidoptera of Alberta," by Mr. K. Bowman.

The society's report is published annually in the Report of the Provincial Department of Agriculture.

BOOK NOTICES AND REVIEWS.

SIX NEW FISHES FROM NORTHWESTERN CANADA. By Francis Harper and John Treadwell Nichols. Bulletin of the American Museum of Natural History, Vol. XLI, Art. 11, pp. 263-270, plate XV. New York, Sept. 22, 1919.

A collection of fishes made by Francis Harper, while on an expedition of the Geological Survey of Canada to Great Slave lake in 1914, in company with Charles Camsell "An Exploration of the Tazin and Taltson rivers, Northwest Territories," by Charles Camsell, Memoir 84, Geol. Series 69, 1916, pp. 1-124, plates 18, map 1), has been found to comprise fifteen species, represented by approximately 120 individuals. Although previous collections of fishes from the region had been scanty and the material in poor condition, the collection described contained a surprisingly large proportion of previously unknown species. The new species described are as follows:

Catastomus richardsoni Harper and Nichols. Richardson's Gray Sucker; "Gray Sucker." Type locality, Talston river, at its junction with Tazin river, south of Great Slave lake. Geographic range, Mackenzie and Winnipeg (?) Basins. Although this species was discovered by Dr. Richardson, it has been either disregarded or considered identical with various other species for nearly a century.

Opsopoeodus borealis Harper and Nichols. Athabasca Minnow. Type locality, Lake Athabasca, at Fort Chipewyan, Alberta. Type specimen, No. 1048, Victoria Memorial Museum, Ottawa.

Coregonus preblei Harper and Nichols. Preble's Whitefish. Type locality, Tazin river, about one mile above its confluence with the Taltson river. Type specimen, No. 1038, Victoria Memorial Museum, Ottawa.

Leucichthys entomophagus Harper and Nichols. Tazin River Cisco. Type locality, Tazin river, at the foot of Kolethe rapids. Type specimen, No. 1021, Victoria Memorial Museum, Ottawa.

Leucichthys athabascae Harper and Nichols. Cisco of Lake Athabasca. Type locality, Lake Athabasca, at mouth of Charlot river, northern Saskatchewan. Type specimen, No. 1020, Victoria Memorial Museum, Ottawa.

Leucichthys macronathus Harper and Nichols. Cisco of Great Slave lake. Type locality, Shore waters of Great Slave lake, near Fort Resolution. Type specimen, No. 1031, Victoria Memorial Museum, Ottawa.

All but one of the above are valuable food fishes. The commercial use of these fishes is becoming more important as settlement advances into this borderland of the north, and the work of Mr. Harper is an indication that much is to be expected when the fish fauna of the region is more thoroughly examined scientifically.

R. M. ANDERSON.

THE BIRDS OF THE RED DEER RIVER, ALBERTA, by P. A. Taverner. Reprinted from the *Auk*, January and April, 1919. A report of work done on and near the Red Deer river in the summer of 1918, by the author, assisted by the keen intelligence of Mr. C. H. Young, both of the Geological Survey staff.

The party floated down the river in a rough but roomy and competent boat made for the purpose, of which the author says that he knows of no important detail where a change would have been advantageous. Camps were made at convenient locations for several days at a time, and each locality was worked as thoroughly as time and circumstances permitted. A map is attached, showing the location of the various camps, and the topography of the country in general.

The present account, including additional information available from local sources, doubtless includes most of the breeding birds of the region. A commendable feature of the report of the expedition is the treatment of the matter of geographical variation, that bugbear of the field naturalist. There are specialists whose energies are (or appear to be) wholly devoted to the discovery of infinitesimal shades of difference between examples of a species from different habitats, and far be it from us to hint that theirs is not a useful niche in the world of ornithology, but the results

of their work are often a thorn in the side, until we become sufficiently calloused to ignore them. Taverner is a radical, and realizes that varietal differences are not always items of the highest importance and goes on his way in blissful carelessness of what some other members of the ornithological world may think or say of his conclusions. It is thus that progress is made, and the present writer finds it difficult, or impossible (?) to criticize such an attitude severely, being too strongly tinctured with that same spirit of radicalism himself.

One evident lack in the preparations for the trip, was the providing of a pair of competent listening ears, for while the sight records of the party are beyond criticism, there are omissions which a pair of good ears might have prevented. Sprague's skylark, for instance, probably delivered its song within hearing, dozens of times, before the bird was added to the list at Camp No. 11, while the Yellow rail lives in most favorable marshes in the district traversed, and needed only to be listened for, to be added.

What the party may have lacked in this regard was fully made up by the keen diligence with which the objects of the expedition were pursued, and the members are to be congratulated on the results obtained.

One must not forget to mention the photographs with which the report is illuminated. To take such views, one needs a keen artistic sense as well as an accurate knowledge of the capabilities of the camera, and both of these the author has with him on the spot, and used them with the very best results. Seldom indeed, is an article read which is illustrated with pictures of such beauty, and which, at the same time, convey to the mind such a clear perception of the country explored.

As a whole, the paper makes a fine starting point for the further study of the birds of that part of Alberta.

W. E. SAUNDERS.

In the *Auk* for July, 1919, are the following titles of Canadian interest:

SOME NOTES ON THE DRUMMING OF THE RUFFED GROUSE, by H. E. T. Trotter, pp. 325-339. This recounts personal experience with, and the study of, the drumming of this species and is an important and interesting contribution to a question that has long been of interest and an object of considerable controversy amongst observers.

THE SINGING TREE, OR HOW NEAR TO THE NEST DO THE MALE BIRDS SING? by H. Mousley, of Hatley, Que., pp. 339-348. This is an account of the methods pursued by this notable warbler nest-finder. The substance of the article is that the male bird has usually a regular habit of singing from a favorite perch, as a rule within twenty yards of the nest. The discovery of a bird habitually singing through the nesting season from a certain point considerably limits the area to be searched for in finding the nest. By carefully watching this area centered on the "singing tree" Mr. Mousley has probably found more warbler nests in the past few years than any one else in an equal time in Canada. The article is a valuable contribution to field methods and to our knowledge of bird habits and should be read by all interested in the field study of birds.

In NOTES ON NORTH AMERICAN BIRDS, pp. 406-408, Harry C. Oberholser concludes that our American Pipit should be reduced to a subspecies of the Old World *Anthus spinoletta* and should be called *Anthus spinoletta rubescens*. He also pleads for the recognition, not at present accorded it, of the Kennicott Willow Warbler as a subspecies of *Acanthopneuste borealis*.

In GENERAL NOTES, under the title of—

THE GENERIC NAME OF THE GANNETS, p. 417, Harry C. Oberholser recommends the adoption of Mathew's proposal to split the genus *Sula* but following the Code of Nomenclature of the A.O.U. decides contrary to him that the name *Moris* is the proper term for the division including our Gannets. *Sula bassana* would thus become *Moris bassana*.

THE STATUS OF THE GENUS ARCHIBUTEO, p. 420, the same author, states that further investigation induces him to agree with Hartert's proposal to unite this genus with *Buteo* as in the feathering of the tarsus, the most important character of *Archibuteo*, it intergrades with it. He, therefore, recommends that *Archibuteo* be reduced to subgeneric rank or dropped altogether in which case our two species would stand as *Buteo lagopus sancti-johannes*, American Rough-legged Hawk, and *Buteo ferrugineus*, Ferugineus Rough-legged Hawk.

P. A. TAVERNER.

PUBLICATIONS OF THE AMERICAN MUSEUM OF NATURAL HISTORY.—The Ottawa Public Library recently received for the Field-Naturalists' Club, the following three books, from the American Museum of Natural History:

"Illustrations of the North American species of the Genus *Catocala*."

"The Indigenous Land Mammals of Porto Rico, Living and Extinct."

"Equidae of the Oligocene, Miocene, and Pliocene of North America, Inconographic Type Revision."

These memoirs have been placed with the Field-Naturalists' collection and may be examined on application.

THE CANADIAN FIELD-NATURALIST

VOL. XXXIV. FEBRUARY, 1920. No. 2

LAKE-SHORE BIRD MIGRATION AT BEAMSVILLE, ONTARIO.

By Hamilton M. Laing, Portland, Oregon.

The following field notes were gathered during the summer and autumn of 1918. While in the service of the Royal Air Force the writer was stationed upon the south shore of Lake Ontario almost due north of the town of Beamsville. Here in checking the aerial gunnery practice six or seven hours were spent daily up in a fifty-foot tower at the water's edge. Periods on duty ranged from daylight until dark. As every day was spent largely out-of-doors and duty commenced on alternate mornings at dawn, excellent opportunity for observation was afforded. A rough bird census was taken daily and new migrants and disappearances thus noted.

The country surrounding the tower and within range of the field glasses consisted of the open lake northward, and to the south stretched a flat typically peninsular farming land of fields and orchards interspersed with remnant wood lots. Most of the notes were gathered from the tower; unless otherwise stated, each record following may be so taken. A few birds were noted in the woods to southward that did not show themselves close to the water.

The course of migration here was from east to west. A great many birds followed the shore and it was plain very early in the season that this was a pathway. Many expected species, however, notably the hawks, were disappointments, and the following gleanings may be as noteworthy for their omissions as their records. Nearly all migrants chose the fine days for moving and almost invariably passed during the early morning hours, or before 9 a.m. There was little movement in the afternoon. The bobolinks, bluebirds, blackbirds, snowflakes, horned larks, waxwings, pipits and swallows made a procession of it here; other species were more retiring and veiled their movements. Birds not mentioned in the following list were not seen in the autumn. No specimens were taken. Where any doubt existed in the mind of the writer, the record is marked so (?). The number in italics after the date gives the number of birds seen. The last notes were made November 26.

Colymbus auritus, Horned Grebe. Oct. 5, first noted; small company. Oct. 13, hundreds occupying waters near shore for several miles. They became quite callous to machine-gun fire and were very numerous till the end of the month. Only on rare occasions was one of these divers noted in flight. Numbers declined as follows: Nov. 6 (50); Nov. 8 (50); Nov. 16 (1); Nov. 18 (few); Nov. 26 (1).

Gavia imber, Loon. Aug. 10 (1); Aug. 20 (1); Sept. 30 (1). During October seen almost daily and often in flight. Nov. 1 (2 in flight); Nov. 6 (young); Nov. 11 (1); Nov. 19 (one flying high south-east across the peninsula).

Larus argentatus, Herring Gull. Aug. 17 (6)? Owing to the difficulty in distinguishing this from the next species, no exact record could be kept.

Argentatus was noted in September and October but very sparingly, and in November the numbers rose and fell apparently with the weather. Nov. 4 (numerous); Nov. 7 (beautiful adult picked up on shore); Nov. 20 (numerous); Nov. 26 (adult and young).

Larus delewarensis, Ring-billed Gull. Much more common than the preceding species up till November. July 21, July 28, Sept. 26, Oct. 13, Oct. 17, Oct. 19 (young); Oct. 23, 26 and 29 (numerous); Nov. 10.

Larus philadelphia, Bonaparte's Gull. Oct. 13 (flock); Oct. 17, Oct. 31, Nov. 1 (flock). Observed also Nov. 2, 3, 4, 6, 7, 10 and 18. Unlike the larger gulls, this bird almost invariably was posting west close to shore.

Sterna caspia, Caspian Tern. Sept. 4 (3); Sept. 25 (2). One of these birds in the first instance and both in the second were travelling east fairly close to shore.

Sterna hirundo, Common Tern. Aug. 19 (12); Aug. 22 (3); Aug. 25 (2); Sept. 6 (flock); Sept. 17 (11); Oct. 1 (20); Oct. 2 (three flocks). In nearly all cases moving westward, low.

Phalacrocorax dilophus, Double-crested Cormorant. On Nov. 21, 23 and 24, a lone bird, doubt-

less this species, took perch on one of the floating targets. Machine-gun fire from the air did not seem to interfere with his fishing.

Merganser americanus, American Merganser. Suspected in the distance more than once, but none of the mergansers were positively identified in the autumn.

Anas obscura, Black Duck. The commonest duck noted on this shore. Noted plentifully from first appearance July 26, until November. Large flocks on the lake Sept. 15. Last noted Nov. 4.

Mareca americana, Baldpate. Sept. 26?.

Spatula clypeata, Shoveller. Sept. 19 (2).

Dafila acuta, Pintail. Sept. 20 (3); Oct. 18 (flock); Nov. 1 (1).

Aythya marila, Scaup. Sept. 27 (flock)?.

Clangula clangula americana, American Golden-eye. Oct. 26 (flock); Nov. 4, Nov. 5, Nov. 10 (flock); Nov. 26 (3).

Charitonetta albeola, Buffalo-head. Nov. 7 (3); Nov. 10 (several).

Harelda hyemalis, Old Squaw. Nov. 4 (flock of 35); Nov. 10 (several).

Oidemia deglandi, White-winged Scoter. One of the common ducks. Oct. 8 (flock); Oct. 17, Oct. 18, Oct. 23 (small flock); Nov. 4, Nov. 10 (2); Nov. 21 (6); Nov. 26 (1).

Branta canadensis, Canada Goose. Oct. 7 (20); Oct. 18 (43); Nov. 2 (small flock); Nov. 5 (14); Nov. 8 (6). Three of these flocks when observed were in migration and followed a south-easterly course toward Niagara.

Ardea herodias, Great Blue Heron. July 22 (2); July 23 (2). During August seen singly almost daily, usually going west, low over the water. Not noted between Aug. 22 and Oct. 15. Oct. 15 (1); Oct. 27 (1). None were seen to stop here.

Butorides virescens, Green Heron. July 27 (2); Aug. 13 (2); Aug. 16 (1);. These two birds were noted at their fishing along the little creek that flowed by the foot of the lower tower.

Nycticorax nycticorax naevius, Black-crowned Night Heron. Aug. 10 (1); Aug. 31 (1). These followed the shore in the evening.

Arenaria morinella, Ruddy Turnstone. Aug. 13 (1). Noted resting on the gravelly beach.

Numenius hudsonicus, Hudsonian Curlew. July 31 (15); Aug. 5 (1); Aug. 6 (small flock); Aug. 7 (4); Aug. 10 (15); Sept. 8 (3); Oct. 1 (2)?. Those noted Sept. 8 were travelling east; the others were going west; none were seen to stop on this shore.

Bartramia longicauda, Bartramian Sandpiper. July 25, Aug. 9 (2); Aug. 10 (2). This species bred locally not far from the tower. The bird observed July 25 either came across the lake or made a wide circuit over the water, as he was noted coming inland several hundred yards. The others were high in air and travelling westward.

Actitis macularia, Spotted Sandpiper. The commonest shore bird in this section. Bred plentifully; very numerous through July and August, the numbers dwindling early in September and by the 11th of the month was gone. A doubtful record Sept. 19. This bird gave no hint of his manner of leave-taking; it simply disappeared.

Calidris arenaria, Sanderling. Aug 1 (3)?. In flight low over water, west-going.

Squatarola squatarola, Black-bellied Plover. Aug. 10 (2); Aug. 23 (flock); Aug. 29 (1). On Aug. 2, the two plover were noted in company with eleven curlews. These plover did not rest here; all were observed west-going.

Oxyechus vociferus, Kildeer. July 23 (7); July 30 (several); Aug. 5 (1); Aug. 7 (2); Oct. 6 (1). The seven observed on July 23 were most probably a family. They were out over the water a considerable distance (300 yards) and were winging off westerly, evidently on a mission.

Aegialitis semipalmata, Semipalmated Plover. Aug. 7 (7); Aug. 12 (5). The first group noted were old and young. They did not use this shore as a stopping-place, but went by low as the other shore birds did.

Totanus melanoleucus, Greater Yellowlegs. Aug. 1 (1)?. Only a fleeting glimpse of this bird was secured though his notes were heard. No other Yellowlegs were observed throughout the season.

Bonasa umbellus togata, Ruffed Grouse. Observed in woods back on rocky ridge. During the "mad" season in October a bird of this species was reported in the orchard near the tower. It was not seen by the writer.

Zenaidura macroura, Mourning Dove. Common through July, August and September. Noted also Oct. 4 and Oct. 13. The latter observation was peculiar for at this date a fledgling barely able to fly was discovered.

Pandion haliaetus carolinensis, American Osprey. Sept. 20, a beautiful adult hunted near the shore during the afternoon and disappeared to eastward.

Circus hudsonicus, Marsh Hawk. An old male in grey plumage came occasionally to hunt in a nearby field. Noted July 25, July 30, Aug. 29, Sept. 10. Doubtless always the same bird. One young bird was seen here also, but the date was not recorded.

Accipiter velox, Sharp-shinned Hawk. Nov. 23 (1)?.

Accipiter cooperi, Cooper's Hawk. Sept. 17 (1)?; Oct. 12 (1); Nov. 30 (1).

Buteo borealis, Red-tailed Hawk. Sept. 18 (1)?.

Falco sparverius, American Sparrow Hawk. Bred locally, but no birds were observed in migration along the shore.

Buteo swainsoni, Swainson's Hawk. Sept. 2 (1)? Possibly a Red-shouldered Hawk, *Buteo lineatus lineatus*. Field description reads: "Yellowish below; darker towards breast; little brown marking on under parts.

Megascops asio, Screech Owl. Oct. 9, heard hooting in the orchard close to the tower at night.

Coccyzus erythrophthalmus, Black-billed Cuckoo. One of these birds evidently nested near the tower as it was observed carrying food over a regular beat. Disappeared July 22 and none seen later.

Ceryle alcyon, Belted Kingfisher. Aug. 17, Aug. 30, Oct. 3, Oct. 13. Always noted singly; never in migration.

Dryobates pubescens medianus, Downy Woodpecker. Sept. 14, Sept. 20.

Dryobates villosus, Hairy Woodpecker. Nov. 2, heard his loud call in the woods a mile south of the lake. Not noted on the shore.

Colaptes auratus luteus, Northern Flicker. Sept. 20 (1).

Melanerpes erythrocephalus, Red-headed Woodpecker. Aug. 26. This bird like the flicker, though breeding locally close at hand, did not appear on the shore more than once in migration.

Sphyrapicus varius, Yellow-bellied Sapsucker. Sept. 29. On this date a young bird was noted in the woods back of the ridge. Not noted on the shore.

Chordeiles virginianus, Night Hawk. Aug 21 (3); Aug. 24 (8); Aug. 27 (2); Aug. 31 (2); Sept. 3 (1); Sept. 6 (1); Sept. 9 (1); Sept. 23 (1). These followed the usual westerly course.

Chaetura pelagica, Chimney Swift. July 28 (4); July 31 (4); Aug. 17 (15); Aug. 29 (numerous); Sept. 1 (2); Sept. 2 (2); Sept. 3 (1); Sept. 4 (1); Sept. 5 (3); Sept. 7 (5); Sept. 9 (2); Sept. 17 (3); Sept. 25 (2); Sept. 27 (several). Their destination was westward.

Trochilus colubris, Ruby-throated Hummingbird. Sept. 14 (1). Female or young.

Tyrannus tyrannus, Kingbird. In greatest numbers about Aug. 22. Numbers thinned by Aug. 28. Sept. 2 disclosed a family, and Sept. 4 a single bird.

Myiarchus crinitus, Crested Flycatcher. Sept. 14. A young bird noted in the timber. Not seen on the shore.

Sayornis phoebe, Phoebe. Sept. 1 (family); Sept. 2 (heard calling); Sept. 12 (2, old and young); Sept. 17 (1); Sept. 26 (1); Sept. 29 (heard).

Contopus virens, Wood Pewee. July 30, Aug. 22, Aug. 28, Sept. 1 (heard); Sept. 6 (heard); Sept. 11 (heard); Sept. 14, 17 and 18.

Empidonax minimus, Least Flycatcher. Aug. 28 (1).

Empidonax flaviventris, Yellow-bellied Flycatcher. Sept. 2 (2). These were noted in the timber back from the shore.

Otocoris alpestris praticola, Prairie Horned Lark. Horned larks bred in the adjoining fields, but migrants supposedly this species followed the shore regularly in small parties throughout October and November. Oct. 2 (10); Oct. 10 (numerous); Oct. 26 (flock); Oct. 30 (flock); Nov. 3 (flock); Nov. 6 (flock).

Corvus americanus, American Crow. Bred locally, but no flocks passed this way in migration. Sept. 23 (family); Sept. 29 (small party); Oct. 1 (4); Oct. 7, Oct. 17, Nov. 9 (2).

Cyanocitta cristata, Blue Jay. Observed back in the timber, but not on the shore.

Quiscalus quiscula aeneus, Bronzed Grackle. Bred locally. The flock of locals after gathering up to about fifty strong on July 20, left and was seen no more.

Scolecophagus carolinus, Rusty Blackbird. Sept. 30 (flock, males and females); Oct. 1 (flock); Oct. 4 (flock).

Agelaius phoeniceus, Red-winged Blackbird. July 22 (15); Sept 1 (small party, males and females); Sept. 18 (12); Sept. 25 (small flock); Oct. 4 (flock). With the exception of the July flock, all the rest were migrants, like the other birds, headed westward.

Molothrus ater, Cowbird. This bird furnished surprises. Bred locally and during July the young were under observation almost daily. On July 31 a female and two young were noted after which the species disappeared entirely until Oct. 4, when a whole flock of males, females and young in company with Rusty Blackbirds, one morning surrounded the tower and spent an hour before moving off westward. A few more followed over the same course Oct 6 and on Oct. 15 a male was noted.

Icterus galbula, Baltimore Oriole. Aug. 3 (2, young); Aug. 11 (male in song); Aug. 24, Aug. 30 (2); Sept. 1 (1); Sept. 2 (2). These birds probably were locals. On Aug. 24 two were seen to fly out over the lake a distance as though restless and ready to move; and their disappearance a week later followed.

Dolichonyx oryzivorus, Bobolink. Bred locally, but it was also one of the most interesting migrants. July 20 ("chinking" restlessly); July 22 (flock of fifty, only one faded male in evidence); Aug 6 (two small flocks); Aug 11 (30); Aug. 15 (flock);

Aug. 17 (flock); Aug. 22 (several flocks); Aug. 24 (several flocks); Aug. 26 (several flocks); Aug. 28 (flock); Aug. 31 (flock heard in the night, 10 o'clock); Sept. 2 (several flocks); Sept. 3 (flock); Sept. 7 (heard passing over). All these later flocks with the exception of one or two on Aug. 22, moved westward. They picked fair mornings and flew low. Usually they followed a course out over the water, aiming at the points on the shore and cutting the bays, and though they were often disconcerted by the aeroplanes, could not be shaken from their course. The height of their migration passed on Aug. 24. All these flocks were small, suggesting families, from five to eight being the rule. None were observed en route in the afternoon.

Sturnella magna, Meadowlark. Bred locally. Observed a small flock of about a dozen almost daily from Aug. 12 till Oct. 17. Only once (Oct. 6) did they show any evidence of migration, when a number of them flew off westward over the orchards as though in farewell.

Astragalinus tristis, American Goldfinch. Sept. 2 (several); Sept. 18 (common); Oct. 29 (five or six flocks heard); Nov. 16 (flock heard). It will be seen that this bird here was somewhat erratic. Only on Oct. 29 when several flocks passed overhead toward the west did it give a clue to its course.

Carpodacus purpureus, Purple Finch. This bird was never definitely identified though the clucking notes thought to belong to this species were heard Aug. 12, Sept. 2 and Oct. 6. A male, probably nesting, sang all summer in the ravine behind the main camp to southward.

Pooecetes gramineus, Vesper Sparrow, Sept. 14, Sept. 26, Sept. 29 (4); Oct. 2 (1); Oct. 4 (1); Oct. 12. This was a common summer resident about the tower, but like the song sparrow gave no hint of its manner of leave-taking. It merely disappeared.

Passerculus sandwichensis savanna, Savanna Sparrow. Bred locally. Sept. 2 (1); Sept. 2 (in song); Sept. 8 (in song). This was the last definite record; there was mystery about this bird. What was probably his migration began Sept. 9. On the morning of this date fully fifty sparrows answering to the Savanna's markings, size and notes, came close by the tower. They took perch in the top of the walnut and locust trees and gave excellent view in the field-glasses. In threes and fours they broke away at short intervals and went dodging off westward, plainly on a mission. On Sept. 14 and Sept. 25 they repeated these field manœuvres. A single bird of the same was noted Sept. 28. To all appearances these were Savannas, but the trait did not seem to ring true.

Zonotrichia albicollis, White-throated Sparrow. Sept. 25 (heard); Oct. 4 (heard in song); Oct. 7 (several seen).

Spizella monticola, Tree Sparrow. Oct. 18 (1); Nov. 6 (5); Nov. 8 (several); Nov. 16 (flock of 12). Never observed en route; always in the shrubbery.

Passer domesticus, House Sparrow. During the late autumn several densely crowded small flocks of these adjustible gamins passed the tower. They were mostly west-bound and suggested a local migration.

Melospiza melodia, Song Sparrow. Perhaps the commonest bird of the locality. Very numerous during September, thinning out in mid-October. Observed also Oct. 31 and Nov. 6 (2).

Passerella iliaca, Fox Sparrow. Oct. 12 (1). Observed in the woods half a mile from the shore.

Junco hyemalis, Slate-colored Junco. Oct. 6 (several); Oct. 12 (numerous); Oct. 13, Oct. 14. As usual, these birds were not noted on the march; they merely came, increased and diminished.

Passerina nivalis, Snowflake. Oct. 15 (2); Oct. 29 (2 flocks); Nov. 3 (4 flocks); Nov. 5 (flock); Nov. 6 (6 flocks); Nov. 9 (flock); Nov. 10 (4); Nov. 16 (flock); Nov. 21 (large flock); Nov. 26 (flock). For the Snowflakes this shore seemed a direct pathway; they never on any occasion showed inclination to come down to the nearby fields.

Acanthis linaria, Redpoll. Oct. 18 (1); Oct. 19 (3); Oct. 20 (several); Oct. 29 (5 flocks); Oct. 30 (numerous); Nov. 3 (flock); Nov. 5 (flock); Nov. 6 (flock). These tiny sprites behaved like the Snowflakes, except that they invariably flew higher. Their chattering notes were the only means to identification.

Pipilo erythrophthalmus, Towhee. Bred locally. Observed in timber Sept. 14 (1); Sept. 29 (1); Oct. 7 (1). Not observed at all on the shore.

Calcarius lapponicus, Lapland Longspur. Noted only once (Nov. 9) when three went clicking overhead.

Petrochelidon lunifrons, Cliff Swallow. Aug. 5 (a few small parties); Sept. 8 (1); Sept. 19 (1)?. It was rather hard to definitely identify the swallows as they posted by the tower on rapid wings. Several "doubtfuls" were recorded. The bird on Sept. 9 was with barn swallows and chimney swifts; the one noted Sept. 19 was alone. All were moving westward post-haste.

Hirundo erythrogaster, Barn Swallow. The commonest swallow here in migration. July 19 (family); July 22 (80 counted, passing a given point in 5 minutes, west-going); Aug. 10 (flock); Aug. 24 (2 families); Sept. 5 (1); Sept. 9 (12);

Sept. 12 (1); Oct. 4 (1).

Iridoprocne bicolor, Tree Swallow. Aug. 10 (1 young in a flock of barn swallows); Sept. 12 (3)?.

Riparia riparia, Bank Swallow. During the summer the commonest swallow species here; several colonies nested in the perpendicular clay banks. Latest appearances, Aug 26 (2); Sept. 1 (2)?; Sept. 12 (5).

Progne subis, Purple Martin. Only one martin was seen on this shore. This was late in August; the date of appearance was neglected.

Ampelis cedrorum, Cedar Waxwing. In very large numbers along the shore by Aug. 10. The height of migration passed about Aug 28, in small parties they moved off along the shore almost exactly as the bobolinks had done. They travelled low, seldom over two hundred feet. Later dates gave Sept. 4 (1); Sept. 5 (1); Sept. 7 (3); Sept. 10 (2); Sept. 11 (1).

Lanius ludovicianus migrans, Migrant Shrike. Bred locally. Old and young, the former with a fledgling house sparrow in its clutches, observed on the range by the tower Aug. 4. Not seen later.

Lanius borealis, Northern Shrike. Nov. 11. Shrike noted on a high perch in the field; doubtless this species.

Vireo olivaceus, Red-eyed Vireo. Aug. 15 (1); Sept. 2 (several); Sept. 8 (1); Sept. 14 (2); Sept. 24 (1); Sept. 29 (2).

Vireo flavifrons, Yellow-throated Vireo. Sept. 8 (1)?.

Mniotilta varia, Black and White Warbler. Sept. 8 (1). Observed in timber half a mile from shore.

Helminthophila peregrina, Tennessee Warbler. Sept. 2 (in song)?.

Dendroica tigrina, Cape May Warbler. Sept. 24 (1 male).

Dendroica aestiva, Yellow Warbler. Bred plentifully. Last young noted July 28. Aug. 6 (2); Aug. 11 (6); Aug. 22 (2). Neither this warbler nor any of the others were observed to make any bold flights. They merely darted from one cover to another.

Dendroica caerulescens, Black-throated Blue Warbler. Sept. 5 (adult male); Oct. 12 (adult male). The second bird was noted back from the shore in the timber.

Dendroica coronata, Myrtle Warbler. Sept. 23 (1); Sept. 25 (heard); Sept. 29 (7); Oct. 1 (1); Oct. 12 (numerous). Observed also Oct. 13, 15, 16 and 17. On Oct. 16 several of these fine warblers were in company with the bluebirds and as they worked below the tower there was a stiff contest between the two over the capture of a species of large insect prey coming from over the water. Often a bluebird and a warbler went after the same victim. Seen from above it was a beautiful picture indeed.

Dendroica maculosa, Magnolia Warbler. Sept. 6, Sept. 14 (family); Sept. 24 (adult male).

Dendroica striata, Black-poll Warbler. The warbler most commonly observed on the shore. Sept. 5, 6, 15, 17. Sept. 19 (2); Sept. 23 (1); Sept. 24 (2); Sept. 25 (2).

Dendroica virens, Black-throated Green Warbler. Oct. 13 (1); Oct. 14 (1). Neither of these birds were on the shore; both were back in the timber.

Geothlypis trichas brachidactyla, Northern Yellow-throat. Aug. 29 (1); Sept. 17 (1). The first was an adult; the second young.

Wilsonia canadensis, Canadian Warbler. Sept. 8 (family). These were observed back in the woods.

Setophaga ruticilla, American Redstart. Sept. 2 (young).

Anthus pensylvanicus, American Pipit. Sept. 13 (3); Sept. 23 (1); Oct. 31 (several). All these birds went by westward above the tower and showed no inclination to stop here.

Troglodytes aedon, House Wren. Sept. 25 (1).

Olbiorchilus hiemalis, Winter Wren. Oct. 7 (heard)?; Oct. 13 (1); Oct. 14 (1). All these birds were in the woods back from the shore.

Toxostoma rufum, Brown Thrasher. Bred locally, but not observed near the shore.

Galeoscoptes carolinensis, Catbird. Aug. 9 (2); Aug. 11 (1).

Sitta canadensis, Red-breasted Nuthatch. Sept. 2 (2); Sept. 8 (2); Oct. 4 (1). The September birds were noted in the timber to southward.

Sitta carolinensis, White-breasted Nuthatch. Oct. 6 (1); Oct. 17, Oct. 31, Nov. 11 (1); Nov. 6 (1). This species followed the shore more closely than the preceding.

Parus atricapillus, Black-capped Chickadee. Sept. 14 (2); Sept. 24 (family); Nov. 1 (numerous); Nov. 6, 7, 11, 26. These little sprites were most numerous during the first week in November. They plainly were working westward. On Nov. 1, during a strong south-westerly wind, four were observed to spring up from a nearby walnut and fight it out with the wind for several minutes. They made two or three trials and then gave it up. They were more numerous at this time than circumstances other than migration could warrant.

Regulus satrapa, Golden-crowned Kinglet, Oct. 12, 13, 14, 30 and Nov. 7. On the last two dates only, the birds were in the apple trees along shore. The earlier records were back in the timber. These birds were always in small companies.

Regulus calendula, Ruby-crowned Kinglet. Oct.

1 (1); Oct. 4 (1); Oct. 6 (3); Oct. 7 (4); Oct. 14 (2). With the exception of the last record when both species were found in company back in the woods, all the ruby-crowns were noted in the orchard below the tower.

Hylocichla aliciae, Grey-cheeked Thrush. Oct. 7 (1)?.

Hylocichla ustulata swainsoni, Olive-backed Thrush. Sept. 2 (several); Sept. 8, Oct. 7 (20); Oct. 12 (50); Oct. 13 (3). Not one bird of these numbers was observed at the tower; all clung to the woods to southward. Owing to the extreme difficulty in distinguishing the grey-cheek from the olive-back in the field, it is possible that numbers of the former may have been overlooked.

Hylocichla guttata pallasii, Hermit Thrush. Oct. 11 (1). On this date a thrush with a reddish tail was observed for a few moments almost directly below the tower. It was doubtless a hermit. Not seen elsewhere.

Merula migratoria, Robin. Sept. 2 (several); Sept. 7 and 8 and Oct. 4, heard in song; Oct. 13 (12); Oct. 18 (3); Oct. 31 (1); Nov. 1 (small flock).

Sialia sialis, Bluebird. Sept. (family); Sept. 14 (family); Sept. 29 (family); Oct. 4 (flock of 30); Oct. 6 (several; Oct. 8 (flock); Oct. 9 (several); Oct. 16 (several); Oct. 17 (several); Oct. 18 (several). The September records probably were all local birds; they were seen remote from the tower. But on Oct. 4 the birds were en route westward. They stormed into the locusts nearby—a beautiful blue blizzard—and after a short council they swirled away again over the orchards. On Oct. 8 a large flock went over without stopping to pay their respects. The later birds were in small numbers and taking their time.

THE FLORA OF WARRENS LANDING, LAKE WINNIPEG, MAN.

By CHAS. W. LOWE, M.Sc., BOTANICAL DEPARTMENT, UNIVERSITY OF MANITOBA.

Warrens Landing is at the extreme north of Lake Winnipeg and at the source of the Nelson river which carries all the waters of the lake to the Hudson Bay. It is north of the fifty-second parallel and is, therefore, in that territory which has been recently added to the Province of Manitoba.

The source of the Nelson river is about 2½ miles wide and is almost blocked by an island which is nearly 2 miles across with approximately 8 miles of coast line. The eastern channel is narrow and comparatively little water flows through it. The western channel is the important one. Here, the only signs or marks of civilization are four lighthouses, two on the mainland and two on the island, and two fishing stations, one on the mainland and one on the island. It was during a visit on the first eleven days in August, 1918, to the fishing station on the island that I made the observations recorded here.

Travelling northwards up Lake Winnipeg one cannot help noticing a number of natural features and I think the most conspicuous is the difference between the eastern and western shores. The eastern shore is strewn with large red rocks of Laurentian granite, whilst the western shore is littered with grey Cambro-Silurian limestone boulders. This feature is alone sufficient to make a study of the flora surrounding the lake of great interest. On the eastern side many species typical of Ontario reach their western limits and on the western shore are found the first of many prairie forms not found in the east.

Another conspicuous feature travelling northwards is the gradual ascendancy of coniferous trees over the deciduous ones. The coniferous trees are not frequent at the southern end of the lake and the deciduous trees are comparatively few around the the northern shores. The prevailing conifer is the white spruce, *Picea alba*, in the more southern parts, and the bog spruce, *Picea mariana*, in the swampy regions of the north. The deciduous trees in the northern parts around the lake are comparatively small and restricted to poplars, willows, and a few birches.

The island at Warrens Landing is practically all muskeg. It appears to be, for the greater part a deposit of mud on the top of granite and covered with from one to two feet of *Sphagnum*. Only in a few places is the rocky substratum exposed. It is thickly treed with the bog spruce. The shore on the south and west is littered with uprooted trees and shrubs. This is the result of rapid coast erosion and is due to the violence of lake storms, the strong and fast current carrying great masses of ice through the very shallow and comparatively narrow channel, and to heavy rain storms. During the eleven days I was there it rained every day and nearly every night and caused frequent landslides along the shore. Water slowly soaking through the *Sphagnum* washes out the loose muddy soil underneath and when a

heavy fall of rain saturates this peaty moss the weight is too great for it to remain in position and it breaks away and slides down to the water's edge.

The dominant feature of the island is the bog spruce, *Picea mariana*. It is by far the commonest and largest tree on the island. Near the shore in a few places the poplars are plentiful, but elsewhere they are scarce, the two species *Populus tremuloides* and *P. balsamifera* are evenly distributed. *Larix laricina* is not infrequent among the spruce.

The interest of the small sandy portion of the island centres on the variety of willows of which there are seven species, some of them being typically northern ones, as *Salix candida* and *S. argyrocarpa*. *Mertensia paniculata* is frequent here. The following beach plants are also restricted to this area, *Lathyrus maritimus*, *L. palustris*, *Artemisia caudata*, and *Juncus balticus* var. *littoralis*.

Two plants usually found in limestone regions, *Rhinanthus Kyrollae* and *Primula mistassinica*, are found on a small mud flat which has been thrown

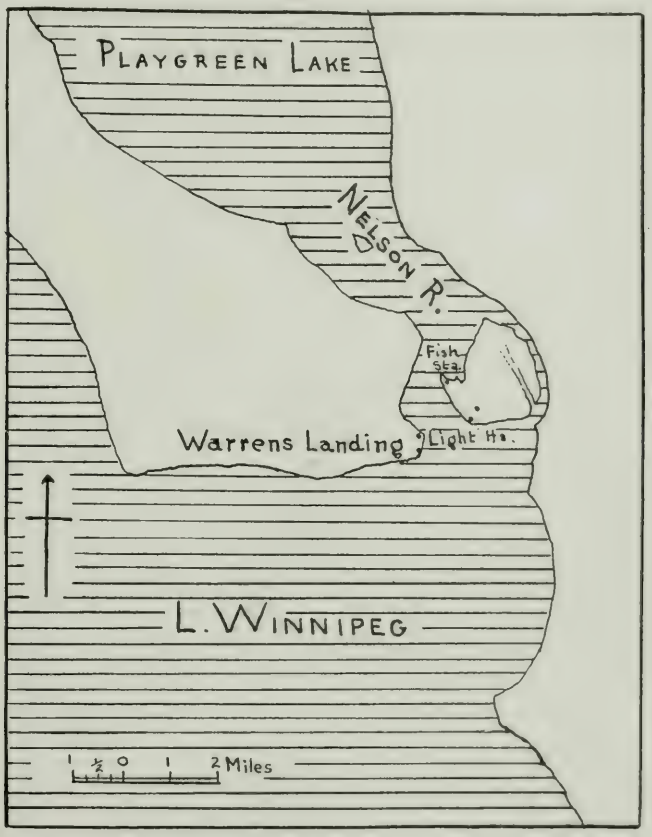


Fig. 1. Map showing the source of the Nelson river and the island in the source of Warrens Landing.

A dense shrubbery undergrowth prevails throughout the greater part of the island and the Labrador tea, *Ledum groenlandicum*, is the most prevalent. Other shrubs less numerous although fairly plentiful are *Kalmia polifolia*, *Chamaedaphne calyculata*; and *Viburnum pauciflorum*.

Under the shrubs many species, typical of northern regions, are found in large numbers. These include *Rubus arcticus*, *Rubus chamaemorus*, *Ranunculus lapponicus*, *Petasites trigonophyllus*, and *Stellaria longipes* var. *laeta*.

up by lake storms and is rich in fragments of broken calcareous shells.

Owing to the heavy and frequent rains many plants were found submerged. One patch of *Drosera rotundifolia*, was in from six to eight inches of water, nearly every plant was in flower and every flower was two inches or more above the water.

In the following list of species the arrangement and nomenclature is as far as possible that used in the seventh edition of Gray's Manual of Botany.

LIST OF PLANTS FOUND AT WARRENS LANDING ISLAND, LAKE WINNIPEG, MANITOBA.

EQUISETACEAE

Equisetum arvense L.
fluviatile L.
sylvaticum L.

PINACEAE

Juniperus communis L. var. *depressa* Pursh.
horizontalis Moench.
Larix laricina (Du Roi) Koch.
Picea mariana (Mill.) B.S.P.

TYPHACEAE

Typha latifolia L.

NAJADACEAE

Potamogeton interior Rydb.
Richardsonii (Benn.) Rydb.

*Carex Bebbii** Olney.
*brunnescens** Poir.
*retrorsa** Schewin.
*utriculata** Boott.
*viridula** Michx.
Eleocharis acicularis (L.) R. & S.
palustris (L.) R. & S.
Eriophorum callitrix Cham.
Scirpus microcarpus Presl.*
validus Vahl.*

LEMMACEAE

Lemna minor L.

JUNCACEAE

Juncus balticus Willd. var. *littoralis* Engelm.
*bufonius** L.
*Richardsonianus** Schutt.



Fig. 2. Part of the shore of the island at Warrens Landing, showing the effect of coast erosion. The trees are Picea mariana, Populus balsamifera and P. tremuloides. In the foreground on the left is Eleocharis palustris.

ALISMACEAE

Alisma Plantago-aquatica L.
Sagittaria latifolia Willd.

GRAMINEAE

Agropyron tenerum Vasey.
Alopecuris pratensis L.
Beckmannia erucaeformis (L.) Host.
*Deschampsia caespitosa** (L.) Beauv.
*Elymus macounii** Vasey.
Hordeum jubatum L.
*Panicularia grandis** (S. Wats.) Mash.
*Phalaris arundinacea** L.

CYPERACEAE

*Carex atherodes** Spreng.
*aquatilis** Wahlenb.
aurea Nutt.

LILIACEAE

Smilacina trifolia (L.) Desf.

IRIDACEAE

Sisyrinchium angustifolium Miller.

ORCHIDACEAE

Habenaria hyperborea (L.) R. Br.

SALICACEAE

Populus balsamifera L.
tremuloides Michx.
Salix argyrocarpa Anders.
candida Flügge.
discolor Muhl.
longifolia Muhl.
lucida Muhl.

Plants marked with * were sent to Dr. M. O. Malte, Ottawa, for identification and confirmation.

Salix pellita Anders.
rostrata Richards.

URTICACEAE
Urtica gracilis Ait.

POLYGONACEAE
Polygonum aviculare L.
Convolvulus L.
Persicaria L.
Rumex mexicanus Meism.

CHENOPODIACEAE
Chenopodium album L.

CARYOPHYLLACEAE
Arenaria lateriflora L.
Stellaria longifolia Muhl.
longipes Goldie var. *laeta* (Richards) Wats.

RANUNCULACEAE
Actaea alba (L) Mill.
rubra (Ait.) Willd.
Anemone canadensis L.
Ranunculus abortivus L.
Cymbalaria Pursh. var *alpinus* Hock.
aquatilis L. var. *capillaceous* D.C.
Flammula L. var. *reptans* (L.) Mey.
lapponicus L.
pennsylvanicus L. f.
sceleratus L.

CRUCIFERAE
Arabis Drummondi Gray.
Brassica arvensis (L.) Kütz.
Capsella Bursa-pastoris (L.) Medic.
Erysimum cheiranthoides L.
Lepidium apetalum Willd.
Radicula palustris (L.) Moench.
Sisymbrium incisum Engelm.

DROSERACEAE
Drosera rotundifolia L.

SAXIFRAGACEAE
Mitella nuda L.
Parnassia palustris L.
Ribes oxyacanthoides L.
prostratum L'Her.

ROSACEAE
Fragaria virginiana Duchesne.
Geum strictum Ait.
Potentilla Anserina L.
monspeliensis L.
palustris L.
Rosa acicularis Lindl.
Rubus arcticus L.
Chamaemorus L.
idaeus L. var. *aculeatissimus* (Mey) R. & T.
triflorus Richards.

LEGUMINOSAE
Astragalus canadensis L.
Lathyrus maritimus (L.) Bigel.
palustris L.
Vicia americana Muhl.

GERANIACEAE
Geranium Bicknellii Britton.

VIOLACEAE
Viola nephrophylla Greene.

ELAEAGNACEAE
Elaeagenus argentea Pursh.

ONAGRACEAE
Epilobium adenocaulon Haussk.
angustifolium L.

HALORAGIDACEAE
Hippuris vulgaris L.

ARALIACEAE
Aralia hispida Vent.

UMBELLIFERAE
Carum Carvi L.
Heracleum lanatum Michx.
Sanicula marilandica L.
Sium cicutaefolium Schrank.

CORNACEAE
Cornus canadensis L.
stolonifera Michx.

ERICACEAE
Arctostaphylos uva-ursi (L.) Spreng.
Chamaedaphne calyculata (L.) Moench.
Chiogenes hispidula (L.) T. & G.
Kalmia polifolia Wang.
Ledum groenlandicum Oeder.
Pyrola asarifolia Michx.
secunda L.
Vaccinium Oxycoccus L.

PRIMULACEAE
Dodecatheon Meadia L.
Primula mistassinica Michx.
Trientalis americana (Pers.) Pursh.

GENTIANACEAE
Gentiana Amarella L. var. *acuta* (Michx.) Horder.

BORAGINACEAE
Mertensia paniculata (Ait.) G. Don.

LABIATAE
Mentha arvensis L. var. *canadensis* (L.) Briquet.
Stachys palustris L.
tenuifolia Willd. var. *aspera* (Michx.) Fernald.

SCROPHULARIACAEA
Rhinanthus Kyrollae Chabert.
Veronica serpyllifolia L.

PLANTAGINACEAE
Plantago major L.

RUBIACEAE
Galium triflorum Michx.

CAPRIFOLIACEAE
Linnaea borealis L. var. *americana* (Forbes) Rehder.
Viburnum pauciflorum Raf.
CAMPANULACEAE
Campanula rotundifolia L.
LOBELIACEAE
Lobelia spicata Lam. var. *hirtella* Gray.
COMPOSITAE
Artemisia caudata Michx.
Bidens cernua L.
Erigeron philadelphicus L.
Petasites sagittatus (Pursh) Gray.
trigonophyllus Greene.
Solidago multiradiata Ait.
Taraxacum officinale Weber.

CANADIAN SPHAERIIDAE.

BY THE HON. MR. JUSTICE LATCHFORD.

(Continued from Vol. XXXIII, page 86)

2. SPHAERIUM CRASSUM Sterki. This species was described in 1901 from shells procured in Northern Michigan. In Ontario it has so far been found in but one locality—an artificial water-course, made about twenty-five years ago to intersect the flow of Cave creek across Holland Avenue, and divert it directly northward to a new outlet above the Little Chaudiere rapids. The members of the Club are now regrettably few who can recall the time when this stream disappeared into a rocky cave or fissure in Hintonburg, south of the Richmond road, and saw light again only when near the foot of Lazy Snye—*le Chenal Paresseux* of the rivermen—a locality prolific in molluscs in those remote days, though now foul and virtually barren.

A few immature shells, collected long ago in Cave creek, on the Stewart and Hinton farms, when it contained a large volume of water, which were thought to be *S. sulcatum*, were probably *S. crassum*. But the very metropolis of the species was not discovered until many years later. It was—not is, I regret to say—in the deepest part of the cutting through the Black river limestone, north of the Canadian Pacific Railway, in the line of Holland Avenue produced. There was at the time about a foot of clear water at the bottom of the trench, flowing freely over a few inches of small pieces of rock—in many cases fragments of cephalopods, corals and brachipods that had flourished and perished on the shores of a torrid sea in the inconceivably remote era when this limestone was in process of formation. Among these relics of primaeval faunas the new species was unexpectedly found in great numbers and beautiful form. Dr. Walker has courteously afforded me an opportunity of examining specimens of the type lot from Michigan. Our shells are larger and more robust, but appear to be identical in many of their aspects.

It is fortunate that an extensive series was secured during the season when *S. crassum* was first observed, as more recent visits to the locality proved absolutely fruitless. The new intercepting system of drainage along Wellington Street had cut off the flow of water from the south, and large blocks of stone fallen from the banks had clogged the cutting so that little water flowed through it. Of this rare and remarkable species not even a "bone"—as a mere value or empty shell is called—could be found, though many of *Lymnaea palustris* (a pond snail that ranges deeply over three continents) and of a large form of *Planorbis trivolvis* were noticed. However, on passing out of the cutting, and reaching a muddy pool in the stretch extending directly southward to the railway, a few good specimens of *S. crassum* were procured. This locality was still producing sparingly in August, 1919. For a few more years it will doubtless afford opportunities for collecting this fine shell, and then, like the ponds which once existed near Gladstone Avenue and St. Louis' Dam, be swallowed by the insatiable city.

S. crassum, when mature, is easily distinguished from *S. sulcatum*, especially when large number of the two species are placed side by side. To state the precise differences briefly and without the use of many technical words is difficult. Perhaps it will suffice to say that *crassum* as found near Ottawa, is less elongated than *sulcatum*, more inflated and heavier; the umbones are larger and rounder, and the beaks more closely approximate. The striae are deeper, and the rest bands are less distinct; the general colour, a deep ashy grey, is much more uniform.

This fine *Sphaerium* probably occurs in other places in Ontario. I have a few shells in poor condition from Masham which may be *crassum*. It is said by Dr. Sterki to have been found in Quebec, and New York, but the localities are not given.[6]

3. SPHAERIUM AUREUM Prime was described in 1851 from speciments probably found by Prof.

[6]Ann. Carng. Mus. Vol. X (1916) p. 432.

Agassiz on the expedition to Lake Superior. It is supposed to be identical with a *Sphaerium* now found in the Upper Mississippi Valley, in Illinois, Iowa, South Dakota, and as far east as North-western Ohio. Such shells are generally light to dark corneous or greyish. As it occurs near Ottawa it conforms more closely to Prime's description, and is "bright golden" or "greenish-yellow." Like *S. crassum* it has been found here in but one station—Moore's Creek in Hull. It is not a common shell, but is least rare in a pool about a hundred yards north of the Aylmer Road, near the abrupt turn of the stream southward, after a short westerly course. It is smaller than *S. sulcatum*, and larger than the recently described *S. torsum*, which are found associated with it in Moore's Creek.

A single representative of each of the three genera of *Unionidae* found in Canada occurs in the same stream—*Unio compressus* Lea, *Margaritana undulata* Say, and *Anodonta ferussaciana*, var. *subcylindracea* Lea—the latter being the only anodon occuring also in the creeks at Stittville and Britannia Highlands.

Mr. C. W. Johnson of the Boston Society of Natural History, has compared specimens of *S. aureum* from Hull with shells believed to be Prime's types, and is satisfied of the corectness of the identification, which Dr. Sterki confirms.

A single shell, shorter and much more inflated—almost sphaerical in fact—from Moore's creek, is doubtfully referable to this species. It might be regarded as merely abnormal if another shell, identical in size and shape, had not been found in the outlet of Meach Lake. If additional specimens should be found, the shell may be entitled to specific rank.

4. SPHAERIUM FLAVUM Prime is another of the shells described from specimens found on the Agassiz Expedition, and was described as from Sault Ste. Marie. Dr. Sterki states its habitat to be "the region of the Great Lakes." Whiteaves[7] records it as collected by Mr. McInnis in the Root and English rivers, near Lac Seul, in north-western Ontario.

My first specimens were imperfect separate valves obtained in the early eighties in the mill pond of Pattee & Perley, at the Chaudiere, which happened at the time to be empty. They were sent for indentification to Tryon of the Philadelphia Academy, who marked them "*S. striatinum*?" It was not until long afterward, one day in late summer, when the river was very low, that the shell was found living about a mile higher up the Ottawa. I was picking my steps along the remains of the dam that once led a portion of the waters of the Little Chaudiere to the pioneer mills of Nicholas Sparks.[8] As the crib work of the dam decayed the filling of stones and gravel was in places pressed outwards into the rapids. In the centre of a runnel in one of the breaches so formed I observed what seemed like a number of golden beads. Closer inspection proved the attractive little objects to be bright yellow sphaeriums unlike any form of *striatinum* known to me. Large numbers were collected in this and other similar places along the dam, and good sets distributed among my correspondents. The shell was so uniformly regarded as *S. flavum* of Prime that I have little doubt of the correctness of the identification.

Although the dam has since been swept completely away, the shell is, I am sure, still to be found in the depressions in the rapids where eddies form and fragments of rock accumulate. However the current is usually so strong that wading would be seldom unattended with danger. One locality for this species is accessible without risk when the river is low. It is in the old mill race itself. Along the shore line, and from fifty to a hundred feet above the dead water in the "Snye," lies a narrow talus, covered in late summer with not more than a few inches of water. On moving the larger stones and raking among the smaller ones, many specimens of this shell may be easily found.

S. flavum is smaller than any of the shells previously mentioned. At Ottawa it rarely exceeds 10 mm. in length. Its color is brighter than that of any of our sphaeriums except the much larger *S. aureum* and certain of the less inflated *S. occidentale*. As no other shell of the family has been observed in

[7] Report Bureau of Mines, 1912, p. 138.

[8] It may be of interest to note that Captain Le Breton's mills at Britannia were of a still earlier date. They were begun in 1818 to serve the military settlements established in that year at Richmond and March, and were the first built on the Upper Canada shore of the Grand river (as the old name of the Ottawa was then commonly abbreviated) above the Long Sault, where Hawkesbury now is. Robert Randall's ambitious projects to develop water power and establish mills and iron works to smelt the Hull ores on his four hundred acre property, purchased in 1809, and extending (in present-day nomenclature) from Bronson avenue to Booth avenue and from Carling avenue to the Ottawa (but not including the islands), were frustrated by the persecution to which he was subjected by members of the Family Compact, his seven years' imprisonment at Montreal, and the scheme devised and successfully carried out by Le Breton and Levius Peters Sherwood, assisted by Sherwood's brothers-in-law, John Stuart and Henry John Boulton, by which Stuart, as sheriff of Brockville, at the instance of Boulton, and without notice to Randall, for whom Boulton had acted as counsel, sold to Le Breton on December 11, 1820, all Randall's lands in what is now the heart of Ottawa. On the next day the captain, as no doubt in duty bound, conveyed an undivided half-interest in the property to Sherwood. The story of this nefarious transaction, which was held nevertheless by a judicial member of the Compact to be within the law, is told at length in Appendix (S.S.S.S.) to the Journals of the Legislative Assembly of Upper Canada for 1853.

The destruction of Sparks' mills is among the faintest of early memories. Of these mills—as of Troy—it may be truly said that even the ruins have perished.

the Little Chaudiere rapids, at least along the Ontario shore, any bright little bivalve found there may safely be designated *S. flavum.*

5. SPHAERIUM RHOMBOIDEUM Say is a shell of great beauty and very wide distribution, its range extending from the New England States to Alaska. The most northerly locality recorded for this province is Albany river, where it was collected by Mr. McInnes.

The specific name, like many of the names applied by the famous naturalist who described it, expresses the most striking characteristic of the species. Certain other sphaeria are rhomboidal in lateral outline; but none appears so obviously to have that form. Other features renders this species readily distinguishable. The epidermis is highly polished, usually dark olive in color, with lighter bands and an outer yellow zone. In a few localities, however, it is of a uniform deep brown. This is especially a marked feature of the shells from the pond on Duck Island, and, to a less extent, of those from the pond on the Metropolitan Electric Company's property at Britannia. Iron in the water may have brought about this effect. No other cause can in my opinion be suggested for the brown color—not only external but incorporated in the substance of the shell of the lymnaeidae which swarm in the bay, opposite the Rideau falls, into which Leamy lake discharges—"the Rafting Ground" of other times, where the huge sticks of white pine, made in the *chantiers* of the Wrights, McGoeys, and Hamiltons, were after their perilous drive down the chutes and cataracts of the Gatineau, formed into cribs and rafts in the spacious days of the square timber trade. Either from rusted chains, iron implements long lost in the bay, or from leachings from the mines and furnaces once operated a few miles to the north, every shell there acquires a coat of brown mail, and many become dwarfed in growth. *Planorbis antrorsus* has not a tenth of the volume of shells of the same species found among the nearby hills; and *Pl. campanulatus* is even smaller than the depauperate form from the marl beds at Hemlock Lake. *S. rhomboideum,* as it occurs not in the bay, but in the canal leading into it from Leamy lake, is not seriously affected, though browner than any found elsewhere except at Britannia and on Duck island.

This species was once very common in the ponds north of St. Louis' Dam, and is doubtless still to be found in Dow's lake, south of it. Farther to the south it ocurs in the outlet of Dow's swamp. To the east it is found in Hemlock lake, but not in large numbers. The most easily accessible and productive locality for it is the creek in Britannia Highlands, at the Bridge on Tavistook Road. It may, however, be met with in almost any stream or pond on the Ontario side of the Ottawa. In the clearer waters of the Laurentian hills it seems to occur but rarely. One specimen has been found in Meach lake, and none elsewhere on the Quebec side. An adult shell of average size measures 13x10x9 mm. Young shells are proportionably less inflated.

6. SPHAERIUM OCCIDENTALE Prime. This is one of our commonest species. It may be found in almost any marsh, or any depression in our deciduous woods where water lies at intervals. Many of the sphaeriidae are capable of enduring long periods of dessication—more apparent at times than real, as some moisture will on careful investigation be often seen to be present; but this species can seal up its activities and lie dormant for weeks or months in the driest situations. Of course all molluscs living in our marshes, and shallow creeks, and ponds, are frozen stiff as icicles every winter; but except in winter comparatively few can remain long alive without water or at least moisture. *S. occidentale* can better endure a long period of absolute drought, such as sometimes prevails in Ontario, especially in recent years, than any of the genus. None of our large bivalves seems capable of enduring dessication for more than a few days or at most a week; though certain Florida kinds have been found alive by Charles T. Simpson in stations which had long been as dry as dust.

In the woods in the Eastern part of the City, near Beechwood cemetery, every hollow contains this *Sphaerium* and no other. In midsummer it may be found in such places by raking the surface of the mould. It is usually bright yellow, oval in outline, but slightly inflated, and seldom exceeds 8 mm. in length. A much paler form ocurs on Lemieux island, south of the new pumping station. It is a clear Naples yellow in color, but does not vary from the normal in any other respect. At Britannia where *S. occidentale* exists in great numbers in the marsh in Loma Park, near the Magee farm, and, on that farm, north of the railway lines, in a hollow under large willows directly north of Britannia Highlands station—a locality singularly prolific in many desirable shells—it is smoky grey in color. West of the village it may be found inside the railway culvert. In these and other stations it is accompanied by several members of the family, and the beginner would do well to procure first the shells of McKay's bush or Lemieux island before resorting to places where several sphaeriums and musculiums are also found.

Under an inch objective this shell will be noticed to be covered with numerous small papillae. This feature has not been observed in any of our other species, and may serve as a means of identifying *occidentale.* Once however the characteristics of the species are carefully observed, confusion with any other known to occur near Ottawa is unlikely.

S. occidentale does not extend as far to the north as *S. rhomboideum*. It ranges however in a belt of irregular width from Quebec and the Eastern States to California and British Columbia.

7. SPHAERIUM TORSUM Sterki was described from shells collected in Moore's Creek in the same station that affords *S. aureum*. I have not found it elsewhere. Dr. Sterki may, however, have specimens among shells sent to him from the Rideau. If so the fact escaped my notice. By his permission—one of many sets of kindness—I append his description:—

Sphaerium torsum sp. nov.

Mussel inequipartite, oblique, well-inflated, posterior part higher, and much more voluminous than the anterior; dorso-ventral axis curved and oblique; beaks strongly inclined forward, large, prominent, rounded, not or slightly, mamillar, superior margin curved, not, or barely, bounded by angles; scutum and scutellum well marked; anterior and posterior ends rounded, inferior margin moderately curved; surface with fine, slight, irregular or subregular concentric striae and a few lines of growth, shining; yellow, straw colored in younger specimens; shell moderately strong, hinge long for the shape and size of the mussel, almost regularly curved, rather slight; cardinal teeth small, the left posterior tooth vestigial in some specimens; laminae rather slight, at almost right angles to each other; ligament covered, resilium moderately strong. Soft parts not examined. Long. 11 mm.; alt. 9 mm.; diam. 7 mm. (100: 83:64).

S. torsum appears to range near *emarginatum* of the same region, but is more oblique, of more rounded outlines, more evenly inflated. The beaks are less elevated, less mamillar, and more inclined forward, and the hinge is much slighter.

Habitat.—Quebec, Ontario, along the Ottawa River near Hull and Ottawa, collected by Justice Latchford. No. 6956 for full-grown, and 7286 for young and adolescent specimens. It occurs also in Wisconsin.

Fossil.—Goat Island, Niagara, collected by Miss J. E. Lotson, 1900, (No. 2224a).

8. SPHAERIUM EMARGINATUM Prime ranges from Maine to Lake Superior and Winnipeg, and northwest to the District of Patricia, where it was found by Mr. McInnes in the Attawapiscat river. Mr. James H. Ferris found it in great numbers in the Montreal river, north of Sault St. Marie, and has kindly sent me specimens from that locality.

In the vicinity of Ottawa this species has been found only in the canal, above Hartwell's locks, and in the outlet of Phillip's lake, in the County of Pontiac. Its resemblance to *torsum* is indicated in the description of that species. The Ottawa shells are slightly more inflated, the average size from the canal being 10.2 x 8 x 7 mm.

9. SPHAERIUM STAMINEUM Conrad does not seem to be a common shell in or near Ottawa, where I have not found it elsewhere than in the Rideau opposite Strathcona Park. In Toronto it abounds in the Don and Humber. The beautiful little Lynn between Simcoe and Port Ryerse, in the County of Norfolk, also affords it in great numbers.

A shell doubtfully considered *stamineum*, but which may be an undescribed species, occurs in the outlet of Swan lake in Pontiac. Unfortunately only a few could be procured.

S. stamineum is approximately triangular in outline and of a uniform yellow color. The name applied to it by Conrad (meaning *thready* or *fibrous*) does not refer to any of its characteristics. Probably *stramineum* (=*strawy*) was the term intended, as that is the prevailing color of the species; but as the specific name applied has some meaning it must stand for all time. Toronto shells average 13.5 x 10 x 9.7 m.m.

10. SPHAERIUM ACUMINATUM Prime. A mussel believed to be this species is very common in Lake Des Chenes, especially above the pier at Britannia and in Graham Bay. Prime at one time at least regarded *acuminatum* as a synonym of *striatinum;* but no form of the latter species that I have ever seen approaches in appearances the Des Chenês shell when mature, though young shells are not unlike young *striatinum*.

In midsummer dead shells may be occassionally noticed washed up along the railway embankment at the southerly end of the bay. Later, when the river is in its lowest state, thousands of this species rise from their drying beds all over the exposed flats, and plough along the surface their slow way—devious at times but in the main direct—towards the receding water. This manifestation of the instinct of self preservation is common to all mussels, large and small, in similar condition; but I know of no place in which it is more plainly exhibited than in Graham bay. The furrows end in a deeper depression when the animal is exhausted or has reached a location sufficiently moist. The number of specimens that one can collect is limited only by the time at one's disposal. Children learn quickly where the shells are to be found, and delight in picking them up and rendering aid to the naturalist who desires a large series of specimens. Identification is rendered easy owing to the fact that no other *Sphaerium* has been found in the bay. Many *pisidia* however ocur there—of which more hereafter; and south of the railway, in the marsh, connected at high water with the bay through a culvert, several species of our three genera of sphaeridae are to be found in early summer.

Eighty or ninety shells found on June 21, 1916, between little islets, near the shore, about five hun-

dred yards west of the pier at North Bay in Lake Nipissing, while similar to *acuminatum* not fully matured, appear to be a different species. If so, they have not been described. Additional material in quantity, collected later in the season, would probably remove all doubt; but an effort to obtain it on the occasion of a subsequent visit failed owing to the height of the water and the absence of proper facilities for dredging. The ten largest shells found average 8.78 x 7, 15 x 5.13 mm. or 100: 81.5: 58.5.

The average size of ten full grown shells found at Britannia is 12.1 x 10 x 7.5 mm. or 100:82.5: 61.5. Four miles up the lake, in Shirley's Bay, the shell is slightly smaller. The species occurs sparsely along New Orchard Beach.

11. SPHAERIUM STRIATINUM LAMARCK was described in 1818 from specimens believed to have been collected in Lake George, New York. The types are, I presume, preserved in the Jardin des Plantes. The type locality lies in a region where there are few collectors, even among those who, like the writer, occasionally visit its lovely shores. My few opportunities have been restricted to the south or upper end of the lake, and were absolutely fruitless. The shell doubtless occurs in one or more of the bays along the east shore, or at the outlet, near historic Ticonderoga.

The desirability of obtaining shells from the locality which furnished the type chiefly arises from the brevity of the original description and the difficulty of determining what shell it was applied to. Lincoln had in his law office a drawer labelled "If you can't find it anywhere else, look here." Similarly *striatium* is a species to which any medium sized shell of the genus may be assigned. Dr. Sterki states (Am. Carng. Mus. Vol. X, p. 437) that almost every *Sphaerium* has been named "*striatinum*."

Mussels believed to be of that species abound on the sandy shoals along the northerly shore of Duck Ilsand. They are so numerous that sometimes in August and September they form a distinct line where washed up by the waves from passing boats, and are preyed upon by plover and other wading birds. Ten adult shells average 11.2 x 8.3 x 5.6 mm., or 100: 74:50. No *Sphaerium* but this has been observed along the upper beaches of the island, unless a shorter and less inflated shell which is but occasionally met with shall prove distinct.

Striatinum has been found in the canal at Cornwall. Shells from that locality more nearly resemble specimens attributed to this species received from various points in the United States than do the Duck Island shells. It occurred among shells collected at Toronto, in the bay east of the mouth of the Humber, a locality now destroyed by harbor improvements, which afforded me the only specimens of the European *Valvata piscinalis L.* discovered on this continent. In passing it may be mentioned that another importation, *Bithynia tentaculata* L., abounds in Toronto Bay, and in the canal at Cornwall.

(To be continued.)

BELATED GUESTS.

BY FRANK MORRIS, PETERBOROUGH, ONT.

In the last week of December, while working on examination papers, I took an occasional tramp with a colleague through the countryside about the city of Peterborough, Ont. We were both armed with field-glasses and got more than the usual run of luck in observations.

On one occasion, west of the city, we sighted a flock of small birds at work among the coarse stalks of pigweed and other plants in a wayside field. The quickness of the birds' movements and the curious unanimity of the whole flock, as it forged hurriedly ahead to a fresh clump of seed spikes, or rose in swirling flight through the air, now warping half across the field, to settle suddenly down, as by a single impulse, at some unexpected point—all this made endless entertainment to watch, even though the bleak wind drew the rheum from one's eyes. On closer view the flock proved to be made up of goldfinches in their sober garb of winter with a sprinkling of snowbirds.

East of the city, again, on Dec. 28th, from the middle of a field beside us, there suddenly rose just such another flock of small birds, for all the world like a flutter of leaves caught up by a random gust and swept through the air; along they came, warping this way and that, now rising, now falling; and suddenly wheeling downwards in mid-air, dropped into a row of elm saplings right beside us. The numerous faint twitterings heard in flight were replaced by one or two, single, clear, deliciously sweet canary notes of *twee-ee, twee-ee,* from some leader of the band. "Goldfinches," I exclaimed; but my companion, more alert with his glasses, soon detected the rich brown-crimson cap of the Redpoll, and before I had time to confound my ears with the more telling evidence of the

eye, another puff of impulse had caught them into the welkin and away beyond our ken.

Hoping next day to get another glimpse of living nature in the form of these winged spirits, we sallied forth after an early lunch past the field of their operations;—nothing to be seen, but the wide-spread carpet of snow with scattered stalks of weeds and dry brown clover heads protruding here and there.

A mile or more east, we turned down a side-road, and had just risen from swamp level with poplar and cedar thickets on either side, when a large cinnamon-brown bird flew across the road in front of us, apparently from the outskirts of an old deserted orchard on our right.

It settled forthwith, in some staghorn sumacs at the margin of the road within 4 or 5 yards of where we stood. Like many birds seen feeding in winter, it appeared remarkably tame; there it perched, while we scanned it leisurely through our glasses; a large bright-brown bird with broken lines of dark throstle flecks on its white breast, a long light brown tail apparently more than doubling the length of the bird; on the forward half of the wing two distinct, if not conspicuous bars of whitish, the upper somewhat shorter than the lower; unmistakably, the Brown Thrasher.

It presented a remarkable picture as it stood swaying slightly in the breeze among the stiff, naked and fantastically angled branches of the sumac; presently, craning forward and up, it drove its long slender bill into one of the quaint, velvety-crimson, candelabra seed-spikes of the "Staghorn," and ate voraciously. A slight breeze was blowing and the delicate plumes of the bird's neck and back ruffled and stirred with the play of the air as soft as thistledown; perhaps this fluffing of its feathers was a protest at the chill of our northern winter. Occasionally the breeze freshened and the bird almost lost its balance, reft of its beloved prop and windbreak of summer foliage; once I saw it partly unfurl the wings, but for the most part it used the long tail for a balancer, depressing and spreading the feathers fanwise in perfect adjustment to the streams of air.

From first to last the bird remained perfectly silent and careless, though aware of its observers. It little skilled to note that here and there in the sumac where the bird had perched, the stout velvety spikes had already been picked to the bone and nothing left but bare skeletons of stem and pedicel; or that on the snow-white floorcloth beneath lay a sprinkling of seed and husk—crumbs from the feast of previous days; none but the most perverse of skeptics needed any such demonstration; in the directness with which the bird flew to the sumac, mounted its perch and fell to, the inference was already plain—here was its daily lunch counter where it had a standing order for one set dish and no other. Many of our winter residents show this constant preference in their food; the Pine Grosbeak flocks to the rowan, the Evening Grosbeak to the Manitoba maple, with the same unerring flight as this Thrasher to the sumac.

We took our fill of this delightful sight and then passed quietly on, leaving the bird still "throng" at its simple one-course meal. The Brown Thrasher has given me many an hour of exquisite pleasure, listening to its rhapsodies of leafy June, but I would not for a wilderness of summer songbirds have missed this sight of him in our December barrens, and the image of it all will not quickly fade from the heart.

Twenty minutes later, as we retraced our steps on the next line south, we were stopped at the crest of a hill by a flock of Redpolls playing in the cedar shrubberies. The birds seemed to court the inner recesses of their thicket, and rather than be spied on presently rose in a twittering cloud and were wafted away to the south. We were just turning away with a sigh of pleased content at their joy of life, when we both on the instant became aware of some larger form moving about under the cedars, skulking in the shadows. Following its direction a few paces, we soon came abreast of it, and quite unconcernedly it stopped and faced about in an open place by the fence; by all the Powers! a Ground Robin or Towhee, and a male at that! black coat, jet hood and cape, white vest flanked at the wings with reddish brown, and when it turned away, a long black tail with conspicuous white margins and cross marks at the outer end.

What were these birds thinking about? Had Dan Whetung of Chemong deceived them to their undoing with his forecast of an open winter, or had birds and Indian chief alike misread the signs of the weather? December the 29th was a fine winter's day, bright and almost calm, with only 10 or 12 degrees of frost; but it is worth noting that three weeks earlier we had passed through a zero dip at least. Three times since, I have gone the same round, approaching the hallowed spots with bated breath, but no further vision has been vouchsafed; and I cannot even be sure whether these summer residents of ours ever managed to see the old year out, or sped south for their new year, as having outstayed their welcome in old Ontario.

NOTES AND OBSERVATIONS.

Migratory Birds Convention Act Prosecutions.

The following is a condensed list of some of the cases brought into court by officers of the Dominion Parks Branch, of the Department of the Interior. The Dominion Parks Branch will be pleased to receive notice of cases brought by private individuals or societies.

Marr Millinery Company, Limited, St. John, New Brunswick, pleaded guilty to having possession of gull plumage, and a fine of $10.00 was imposed.

Nettie McKinnon, Digby, Nova Scotia, fined $10.00 for having gull plumage in her possession.

Miss G. P. Mawley, Summerside, Prince Edward Island, fined $10.00 for having Brant out of season.

George Arsenault, St. Elinor's, Prince Edward Island, sold Brant in June and was fined $10.00.

Mr. McAdam, manager, Island Cold Storage Company, Charlottetown, Prince Edward Island, fined $10.00 for having Brant in his possession and birds confiscated.

Francis Ruggles, Caledonia, Nova Scotia, fined $10.00 for shooting White-rumped Sandpipers.

Edgar Fromm, Frank Dixon and John Tingley, Westmorland County, New Brunswick, were convicted for having black duck out of season, and penalties of $20.00 each imposed.

T. G. Butler, Ottawa, fined $10.00 for having a mounted loon.

James Baker, of Clam Harbour, Nova Scotia, found guilty of illegal possession of eider duck and fined $10.00.

Victor Crain, of Boston, Massachusetts, found guilty and gun confiscated for shooting shore birds in Yarmouth County, Nova Scotia.

Wallace Hatfield, of Central Argyle, Nova Scotia, was convicted of shooting Willets.

Charles Muse, of Central Argyle, Nova Scotia, also convicted for same offence.

Freeman Deviller, of Lower Melbourne, Nova Scotia, ordered to release young flock of ducks held in captivity.

The following mounted birds were confiscated at Ottawa: A Great Blue Heron, a Flicker, a Wood Duck, 3 Loons, a Herring Gull, and a Pileated Woodpecker.

Eugene Van Anberg, of Lockport, Nova Scotia, found guilty and fined $10.00 for shooting an eider duck.

Ernest Thoburn, Lower Jordan Bay, Nova Scotia, fined $10.00 for shooting eider duck.

Winslow Buchanan, Lower Sandy Bay, Nova Scotia, shot an eider duck, and was fined $10.00.

The Absence of Song Birds in the Wilderness of Nova Scotia.—Any "bird man" who for the first time makes a trip to the wilderness country in the interior of the Province of Nova Scotia will be struck by the absence of bird songs. There are birds, it is true, but no real singers that at times compel us to pause in the act of dipping our paddle in the glassy lake or arrest our hasty step as some of our best feathered performers of the orchards and the clearings do. Occasionally the croak of a raven is heard or the *dee-dee* of chickadees, both the common variety and the Hudsonian, and at night the hoot of the Great-Horned Owl. The Canadian Jay is quite common and well known with his extremely slow and noiseless flight, and his discordant *ca-ca*. Occasionally a flock of Crossbills will pass overhead with undulating flight, spreading out and closing together again in fan-like fashion, leaving one wondering why they do not collide and injure their frail wings. The flute-like whistle of these little acrobats is quite pleasant when nearby, and yet it would be impossible to describe it as a song. During the fall months, one meets more birds in the wilderness than in the spring or summer. These, also, however, are not real singers, with the exception of the robins which at this time are indifferent to song, being too busy fattening upon the luscious berries that cover the barrens in great profusion. When seen far from habitation and especially in the autumn they will nearly always be accompanied by Flickers, migrating together in perfect harmony, the latter "sticking" against the dead pine trunks while the robins seek the bare branches. I have watched them many times while moose calling in the early frosty mornings of September and October, and never have seen any discord among them. It is quite the reverse with the Canadian Jays, which seem to agree when not feeding, but quarrel fiercely, though ludicrously, when engaged in stealing from a moose carcase. These latter are very bold and it is a common sight to see them tearing at a moose carcase while the operation of gralloching is in process. Perhaps one will tear off a piece of fat and fly through the swamp with two or three others pursuing him, the tit-bit changing ownership many times before the fortunate one

is left to enjoy his prize in peace. Occasionally one sees a solitary Swamp Sparrow as he patters over the mud and trash caused by the overflow of lake or river. His discordant metallic *chink* does not impress one as a feathered friend at all. The first time I visited the Nova Scotia wilderness in quest of big game, when a boy of sixteen, I remarked upon the absence of crows to an old guide. "No sir," said he, "you will never see or hear one back here, but I should like to bring a live one out here and let him go; he wouldn't live long." "Why?" I queried. "Oh," the guide replied, "he would fly up to one of these big granite rocks and caw himself to death trying to locate a friend." This fall I was surprised to hear a Song Sparrow burst forth into song. He was at least twenty-five miles from civilization. I waved my hat in his direction and wished him a safe journey south and an early return next spring. He was the exception to the rule.

We may sum up the perching birds that may be seen in the wilderness here as follows: Great-Horned Owl; Raven; Jay; Chickadee; Crossbill; Flicker; Robin; Hawk; Swamp Sparrow. The first five mentioned are residents.

H. A. P. SMITH, DIGBY, N.S.

BOOK NOTICES AND REVIEWS.

LEAD POISONING IN WATERFOWL, by Alexander Wetmore, Bulletin No. 793, U.S. Dept. Agr., Professional Paper, Washington, D.C., July 31, 1919. This is a twelve-page pamphlet of considerable interest to sportsmen, conservationists and ornithologists. Many of our ducking marshes have been shot over for a good many years. Each shot so fired scatters in the neighborhood of an ounce of shot over the bottom. Mr. Wetmore estimates that on one large marsh examined by him an average of 75,000 shells are fired annually. This amounts to over two tons a year. As lead shot resists corrosion and is practically everlasting, the effect is cumulative and amounts to over eighty tons in the past twenty years. The shot gradually sinks in the mud, of course, but as tipping ducks, such as Mallard, Pintail and others, dig down into it from 12 to 16 inches, it is evident that their opportunity for picking up shot is considerable. On examination the author found in the mud from the bottom in the neighborhood of favorite shooting stands from 20 to 22 No. 6 shot in each sample dredged up and examined. The ducks in sifting through the mud for food retain any small hard particle like gravel and the presence of real gravel does not seem to prevent them from taking the shot as well. Experiments on captive specimens of wild species proved that six pellets, often less, are fatal to ducks.

In this manner large numbers of ducks have been poisoned in certain marshes every year though it is only lately (see Bowles, *Auk*, XXV, 1908, pp. 312-313) that the cause of the deaths was recognized. By a process of experiment and elimination it was proved that it is the lead content and not the additions to the metal such as arsenic that causes the trouble, though chilled shot is less rapid in its effects than soft.

The paper deals at length with the symptoms and pathology of the poisoned conditions. The first effect is a weakening of the wing muscles until the power of flight is lost, difficulty is experienced in walking and partial or complete paralysis of the legs ensues. The wings drag and the tail droops. The bird's appetite remains good and even increases, but the food does not seem to pass the stomach and the proventriculus and lower esophagus become distended with food. The fecal matter is green and watery. The heart is finally affected and death comes in from a few days to five weeks.

Though magnesic sulphate in water, 60 grams to 10 quarts, seems to give relief and sometimes cure in individual treatments no suggestions as to treatment or prevention on a large scale is proposed. It is suggested that by its nature the trouble is more likely to increase than decrease but the author seems more anxious over the effect the lead poisoning will have, even in the cases of birds showing considerable resistance to or even recovery from it, on reproductive fertility, than over the number it actually kills.

So far only Mallards, Pintails, Canvas-backs, Whistling Swans and Marbled Godwits have been known to be affected, and as shot is common in stomachs of wild ducks examined by the Biological Survey, it seems that some individuals or species have more or less tolerance for, or resistance to, lead poisoning, or its effects would be more widespread and serious. It would be well for the sportsmen to look out for sickly ducks and examine them for lead poisoning, in order that fuller details may be known.

P. A. TAVERNER.

ANNOTATED CHECK LIST OF THE MACROLEPIDOPTERA OF ALBERTA. By Kenneth Bowman. Published by the Alberta Natural History Society, Red Deer, Alta., 16 pp., February, 1919.

For a number of years the late F. H. Wolley-

Dod, who was one of our leading lepidopterists, published in the *Canadian Entomologist*, a series of papers dealing with the lepidoptera of the province of Alberta. Since the appearance of Mr. Dod's last paper, however, other indefatigable collectors, particularly Messrs. Bowman and Mackie, of Edmonton, have added many records new to the province. The new list prepared by Mr. Bowman is certainly a useful publication and I have had many occasions to refer to it. In the preparation of this list the author has "endeavored to provide an epitomy of what has been accomplished by students of this order within the province to date, as an aid, not only to present workers, but those who will follow after."

ARTHUR GIBSON.

OTTAWA FIELD-NATURALISTS' CLUB SATURDAY AFTERNOON EXCURSIONS FOR THE SEASON OF 1920.

May 1. Geology.—Rockcliffe Park.—Meet at the first stop in the Park.

May 15. General natural history.—Catfish Bay, along the Ottawa River just west of Hull.—Meet in front of the Eddy Co's office.

May 29. Botany and Ornithology.—Fairy Lake. Take the Chelsea road electric car line to the end of the loop.

June 12. Entomology (Mr. C. B. Hutchings, Leader).—Queen's Park, Aylmer.

June 26. Horticulture (Mr. W. T. Macoun, Leader)—Central Experimental Farm, Ottawa.

Sept. 18. General natural history.—Britannia.

The time of meeting at the points indicated will be 2.45 p.m. Leaders conversant with the subjects mentioned will be present to render assistance. All interested are cordially invited to attend.

An unusually well-attended meeting of the Excursions Committee of The Ottawa Field Naturalists' Club was held on the afternoon of April 8, for the purpose of formulating the above programme for the coming season.

Reference was made incidentally to two very enjoyable reunions of the Club held during the past winter, and the intention was expressed of holding similar meetings and outings during the next winter season.

OBITUARY.

JAMES MELVILLE MACOUN, C.M.G.

Succumbing to a fatal illness, James Melville Macoun, C.M.G., passed peacefully away, in Ottawa, on January 8th, 1920.

The late James Macoun was born in Belleville, Ont., in 1862, and was the son of Professor John Macoun, the illustrious Father of Canadian Botany, who, living at Sidney, on Vancouver Island, B.C., is still active in natural history research. James Macoun attended the Belleville High School and Albert College, where, at that time, his father was Professor of Botany. When, in 1882, Professor Macoun was called to Ottawa to take charge of the botanical and other natural history work in the Geological Survey, James Macoun became his Assistant, beginning regular work with the Dominion Government in 1883. As early as 1881, however, he assisted his father in field work, exploring the territory between Portage la Prairie, Man., and the headwaters of the Assiniboine.

James Macoun was a born naturalist and natural history explorer. Although, by natural inclination, he gradually specialized in botany, he made most valuable contributions in other branches of natural history. The wideness of the extensive scope of work in which Mr. Macoun was engaged during his long career as a Canadian naturalist may be more fully realized from the brief data which are presented herewith.

In 1884, at the age of twenty-two, Mr. Macoun made extensive collections of Cambro-Silurian fossils in the Red River valley, Man., on the west shore of Lake Winnipeg, and on the adjacent islands. In 1885, he collected natural history specimens in general in the Lake Mistassini district in the Province of Quebec and, the following year, worked along the line from Lake Winnipeg, Man., to Hudson bay. In 1887, Mr. Macoun explored islands of James Bay and contributed much interesting information, floristic and zoological, to the knowledge of the natural history of the southern part of the Hudson Bay region.

In 1888, he collected plants and birds along the Athabaska and the Churchill rivers, and in the following year collected, with his father, birds, mammals, reptiles and insects in British Columbia. He also greatly assisted his father in making a very

complete collection of the flora from the Pacific Coast to the Eagle Pass in the Gold Range, a distance of nearly 400 miles on the Canadian Pacific Railway. In 1890, he again worked in British Columbia, assisting his father collecting on the Columbia river along the Kootenay lake, and in the Selkirk and Rocky mountains.

Up to this time, Mr. Macoun had devoted his time and energy to natural history study in general. His intimate knowledge of methods and his ability to draw reliable conclusions from his findings were then fully recognized by the Geological Survey and, as a result, his wide knowledge and his skill as an investigator soon prompted the Government to engage him in special and important work.

When, in 1891, the fur seal conditions in the Northern Pacific became of international importance, Mr. Macoun was made Secretary to the late Dr. G. M. Dawson, Director of the Geological Survey and Behring Sea Commissioner of Canada, and in this capacity he went to the North Pacific to investigate the fur seal conditions. His services in the study of the habits and life history of the fur seal proved so valuable that he was retained on this special work in 1892 and 1893, and sent to Europe as an expert in connection with the Fur Seal Arbitration. In 1896 he again went to Behring Sea, and also in 1914. In 1911, he was one of Canada's representatives at the Fur Seal Conference at Washington, D.C. Because of his most valuable work on the international fur seal investigations he was made a C.M.G., at the recommendation of Lord Bryce, then British Ambassador to Washington.

Mr. Macoun's intimate knowledge of Canada's forestry resources was taken particular advantage of by the Government in 1899. That year Mr. Macoun was placed in charge of the Canadian Forestry Exhibit, which was to be displayed at the Paris Exposition in 1900. Mr. Macoun brought together a magnificient collection of Canadian forestry products which, when exhibited in Paris, most strikingly demonstrated to all Europe the immense timber resources of the Dominion.



JAMES M. MACOUN, C.M.G.

When in Paris, in 1900, Mr. Macoun also attended the International Congress of Botanists, which was called together for the purpose of drafting rules and regulations to govern the use of botanical nomenclature. On behalf of Canada, Mr. Macoun signed the recommendations which later were adopted at the International Congress at Vienna, thus committing Canadian botanists in official positions to adhere to the so-called "Vienna rules of nomenclature" in botany.

In 1903, Mr. Macoun undertook an investigation of the Peace river country in general, and of the upper portion in particular, to ascertain the true character of the soil and climate of that part of

Canada. His resultant report displays, in the amplest degree, a faculty of observation given to but a very limited number of investigators, and a fearlessness in presenting the results of findings which is, and always will be, the highest and most valued characteristic of a genuine scientific investigator and a true public servant.

When not engaged in the special work briefly referred to, Mr. Macoun was, during his last 20 years, largely occupied with botanical work, except in 1909, when he spent considerable time assisting his father in the preparation of the "Catalogue of Canadian Birds." Remaining in Ottawa during the summer of 1897, for the first time since being connected with the Geological Survey, Mr. Macoun made a special study of the violets of the Ottawa region, discovering species new to science, and in 1913 he again collected in the Ottawa region, supplementing the botanical material which had been brought together by his father and himself with a view of publishing a "Flora of the Ottawa District." In 1910, Mr. Macoun studied the fauna and flora on the west coast of Hudson bay, and, in 1912, he was engaged in botanical work on Vancouver island, particularly in Strathcona Park where several species new to Canada as well as to science were discovered. From 1914, he worked in British Columbia and in Jasper Park, Alberta . The islands of the Gulf of Georgia, as well as the Comox district of Vancouver island, were thoroughly investigated from a botanical standpoint. During the last two years, Mr. Macoun made a most complete botanical survey of Jasper Park, Alta., extending his working field the last year westward along the Grand Trunk Pacific railway.

Mr. Macoun was appointed Assistant Naturalist in the Geological Survey in 1898 and Botanist in 1917. In 1918, he was appointed Chief of the Biological Division.

This brief outline of Mr. Macoun's field work and career as a naturalist may give some idea, although a rather incomplete and vague one, of the magnitude of the scope of work undertaken by him.

His unique record will, by force of its excellence, guarantee him an ever-honoured place as a Canadian naturalist of the highest rank. As a botanist, particularly, he contributed enormously to the knowledge and understanding of the Canadian flora. His extensive travels made him familiar with the flora from eastern Canada to the extreme islands off the Pacific coast, and from the hot and arid parts of southern British Columbia to the tundra of the Arctic. No one in Canada, with the exception of his illustrious father, ever possessed such a thorough knowledge of the Canadian flora as did James Macoun, and, as a result, he was justly recognized and esteemed as the greatest authority in matters botanical, next to his venerable father, that Canada ever produced. His name is indelibly written on the pages of the History of Canadian Botany.

Mr. Macoun's fame as a botanist and as a naturalist in general may be contributed to three main characteristics, namely, a brilliancy of mind enabling him to grasp quickly and accurately the central idea of arguments and the relative value of evidence presented, an in-born love of investigations for the sake of the investigation itself, and a fund of energy which permitted no physical obstacles to be raised in the way of his investigational efforts.

Extremely modest and unassuming, Mr. Macoun was the type of scientist who derives complete satisfaction from the conscientious persecution of his work without seeking public reward for the service done.

Mr. Macoun was a true scientist whose untimely death is sincerely deplored by his many scientific and other friends. The Ottawa Field-Naturalists' Club is feeling his departure deeply and recently expressed its sentiments in the following resolution:

"The members of the Ottawa Field-Naturalists' Club desire to place on record their deep sorrow in the death of their fellow member and friend, Mr. James M. Macoun, C.M.G. Mr. Macoun's reputation as a careful, conscientious naturalist was by no means confined to Canada. In his death the Geological Survey has lost a valuable officer and members of the Ottawa Field-Naturalists' Club a true friend, ever ready to assist, not only in the furtherance of the botany of Canada, but in other branches of natural history as well The council desires to express its sincerest sympathy to his widow and daughter."

M. O. MALTE.

THE CANADIAN FIELD-NATURALIST

VOL. XXXIV. MARCH, 1920. No. 3

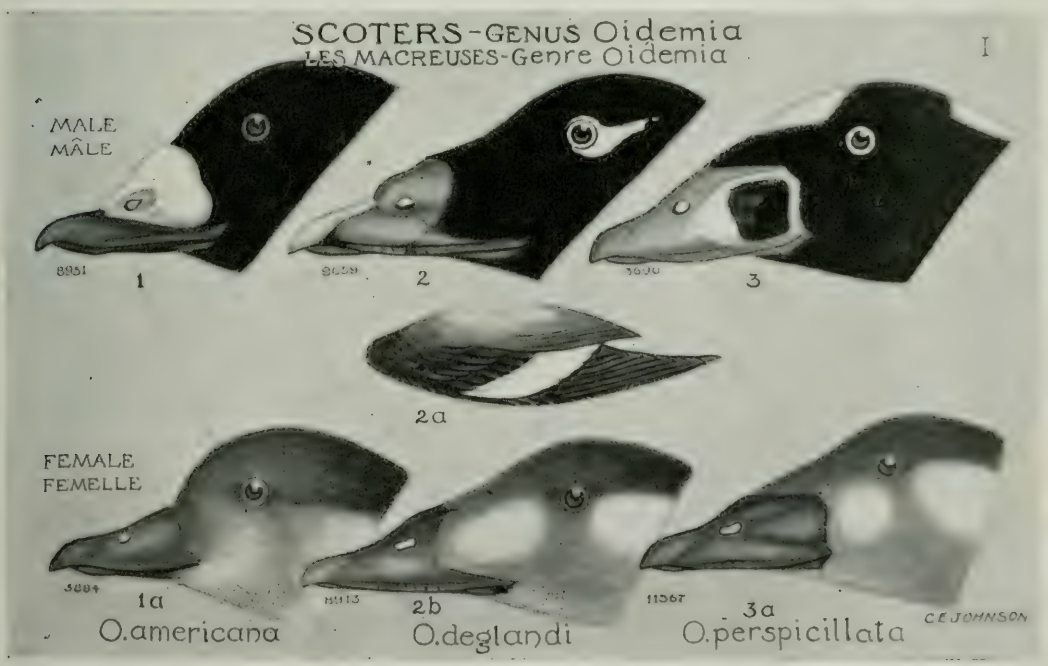
THE SCOTERS AND EIDERS.

By P. A. Taverner.

(Published by permission of the Geological Survey of Canada.)

The scoters and eiders are often regarded by the amateur ornithologist and the general sportsman as confusing groups. Whilst the males are well marked by color and bill characters some females bear close general resemblance to each other. The following diagnosis and plates may therefore be of interest to those who have occasion to identify these species. Two species of eider, Steller's and the Spectacled, are rather different from the others, but as they only are to be expected in the extreme northwest, Alaska and the Yukon, they need rarely be considered in connection with eastern material.

Except these two species, the scoters and eiders are ducks of the largest and sturdiest build. As the accompanying plates show, the males are characterized by unusually heavy bills often with strange swellings, protuberances and extended processes. In the females these bill characters are reduced; but, except in the American Scoter, they retain enough peculiarity of shape for ready generic recognition. Generally juvenile males are similar to the females but soon show sufficient traces of the coming adult plumage to indicate their sex.

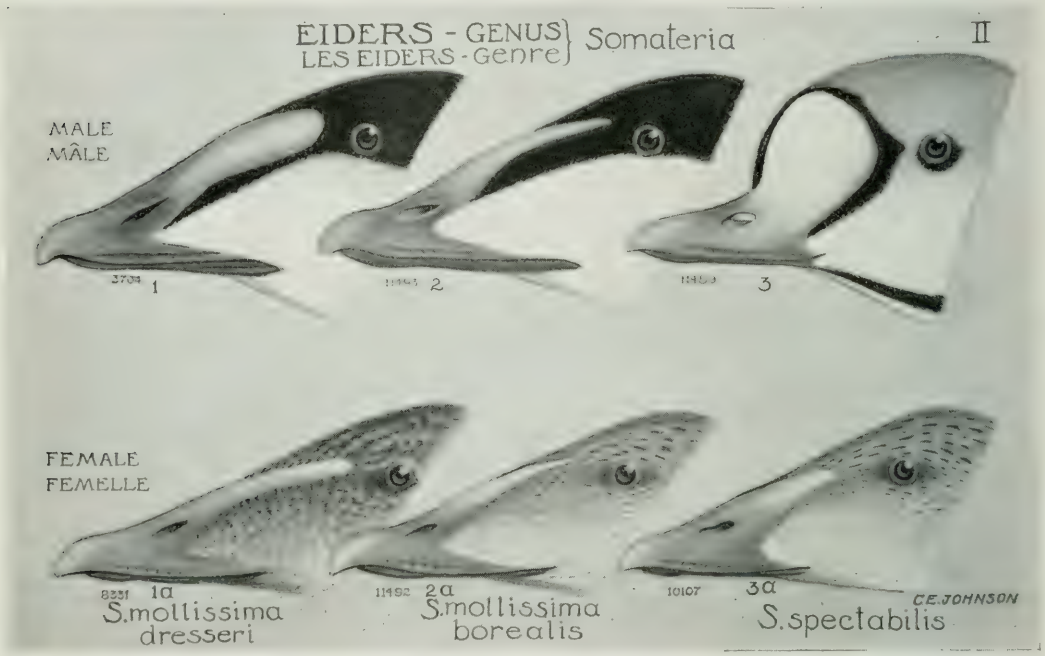


THE SCOTERS.

The adult males of all the scoters are practically solidly black birds or with only restricted and sharply defined patches of pure white on head or wing. The females are without variegation, dark brown gradually lightening below or on breast and face, and show no indication of bars or streaks. The bills of all plumages except that of the female American Scoter are characteristic.

AMERICAN SCOTER, *Oidemia americana.*
Plate I, Figs. 1, 1a.

The adult male is solidly black without spot or touch of other colour except the butter-coloured swelling at base of bill. The female shows a comparatively normal duck bill, the feathering neither encroached upon nor encroaching on the sides of the bill. There is a more or less well defined dark cap including the sides of the crown, contrasting with the cheeks that are evenly coloured instead of showing two diffused light patches as in the other two scoters.



WHITE-WINGED SCOTER, *Oidemia deglandi.*
Plate I, Figs. 2, 2a, 2b.

The prominent white wing patches (Fig. 2a) in all plumages of this bird prevents its confusion with any other species. The adult male is all black with a white crescent under the eye, white secondaries and a bill coloured in bright reds and black. The female has two vague light spots on the cheek like the Surf Scoter, and the feathering of the cheeks encroaches upon the sides of the bill nearly to the nostrils and about as far as that of the crown.

SURF SCOTER, *Oidemia perspicillata.*
Plate I, Figs. 3, 3a.

The adult male is an all black bird with small white patches on the fore and hind crown. In some changing or moulting plumages this latter is lost wholly or in part but its position and outline can still be traced in a depressed area of soft black velvet-like feathers. The sides of the bill encroaches on the cheek feathering in a square shape and is coloured bright yellow, red and white with a strange squarish spot of black as shown. The female has two lightish patches on the sides of the face like the female White-winged, but the bill surface intrudes upon the feathering of the cheek in the same square shape as in the male and the feathering of the crown extends half way to the nostril and far beyond that on the sides of the bill. The square black spot at the base of the bill is indicated in the juvenile male at an early age and before other sexual characters are assumed.

THE EIDERS.

Adult male eiders are easily distinguished from similar scoters by being colored in large contrasted masses of black and white, the latter variously suffused on face, fore and under parts with delicate nile-green, pale slate-blue or vinaceous (pinkish). Comparable scoters are nearly solid black, relieved only by restricted, sharply defined patches of pure white about head and on wings.

Female eiders are colored with mixtures of black, brown, ochre and rusty in various proportions, tending towards fine streaks on face, coarser ones and V-shaped markings on back and broken bars across breast and flanks. The cross barring across the upper breast of the females is sufficiently distinctive of the eiders to separate them from any other duck

regularly occuring in Canada. Comparable scoters are solidly coloured dark brown without variegation except for gradual lightenings of face, fore parts, and below,—they are entirely without bars or streaks.

KING EIDER, *Somateria spectabilis.*
Plate II, Figs. 3, 3a.

The greatly enlarged bill process, coloured bright yellow, easily distinguishes the male of this species. The feathering of the fore crown and the cheeks are diagnostic in other plumages. In this species the crown feathers extend down the ridge of the bill as far as the rear of the nostrils, whilst the feathering of the cheeks does not extend as far as that of the crown. In other comparable eiders the cheek feathering projects forward of that of the crown.

ATLANTIC EIDER, *Somateria mollissima.*
Plate II, Figs. 1, 1a, 2, 2a.

The long Y-shaped arms of the bill processes extending up the sides of the crown are distinctive of the male Atlantic and the Pacific Eiders. In the females of these species the crown feathering not nearly reaching to the nostrils and the cheek feathers extending beyond those of the crown are diagnostic.

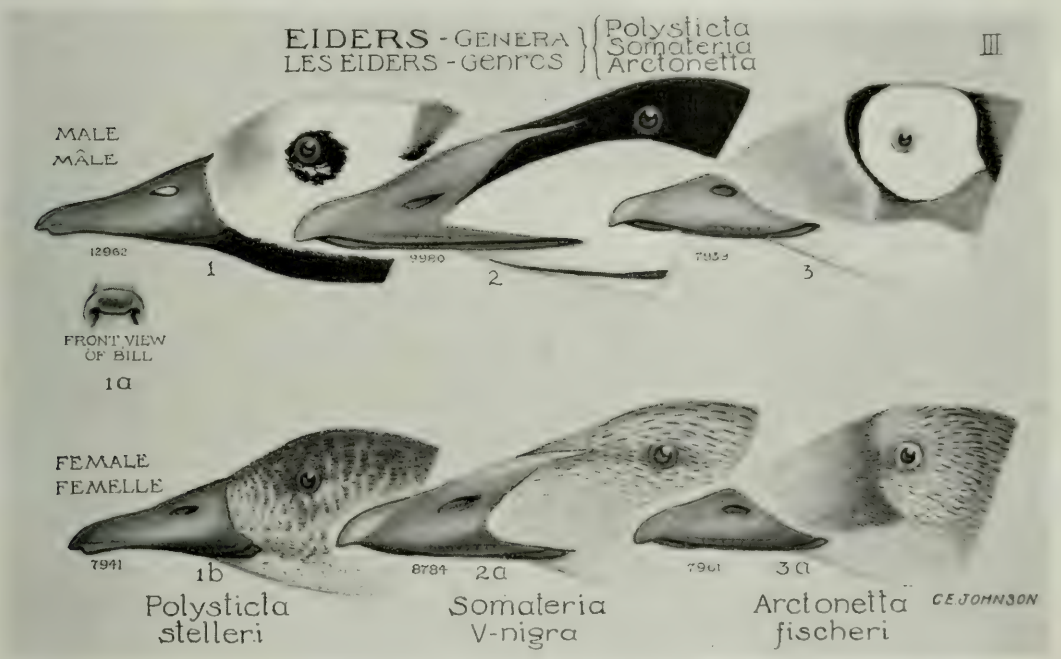
In the 1910 A.O.U. Check List, the standard authority, the American Eider is given as a full species, *Somateria dresseri.* Late investigation, however, has shown that it is only a subspecies of the eider common to the New and Old Worlds (Atlantic Eider), as all intermediates between it and the Northern Eider, *Somateria mollissima borealis* can be shown to exist. The American Eider therefore becomes *Somateria mollissima dresseri.* These two American forms can only be separated by the bill processes on the sides of the crown. In the American Eider these processes in either sex are broad and end in a well rounded instead of a pointed tip as in the Northern and the Pacific Eiders.

PACIFIC EIDER, *Somateria v. nigra.*
Plate III, Figs. 2, 2a.

The Pacific Eider can usually be told from the Atlantic Eider by the black V-mark on the throat similar to that of the King Eider. In occasional Atlantic specimens this throat mark is said to be present, in which case and in females, the relatively larger and heavier bill, the shorter and more acutely pointed bill processes on the fore crown, and the slightly blunter ending of the feathering on the sides of the bill of the Pacific seem to be the only diagnostic guides. None of these points are satisfactorily obvious or reliable but the ranges of the two species are so widely separated that it will only be birds from a limited section of the Arctics or occasional stragglers that need ever be confused.

SPECTACLED EIDER, *Arctonetta fischeri.*
Plate III, Figs. 3, 3a.

The white spot about the eye and the black spectacle mark of the male Spectacled Eider is unmistakable. In the female this white eye spot is indi-



cated by a similar patch of feathers scarcely distinguishable from the surrounding area in coloration but of peculiar velvety texture that makes its outlines obvious. In all plumages the feather line of the bill is distinctive, extending down the culmen of the bill well over the nostril, cutting in an almost straight line from thence to the gape at the sides.

STELLER'S EIDER, *Polysticta stelleri.*
Plate III, Figs. 1, 1a, 1b.

This is the smallest and the most divergent of the eiders. The male with his strangely pied head and silvery sheen on face is distinctive. The female can be recognized from other eiders by its steel blue speculum edged above and below with a white line like a mallard.

Probably the bill gives the most satisfactory single character for the recognition of the species. Coues says of it,—"tomial edges dilated and leathery." In all dry specimens seen by the writer the edges of the upper mandible are incurved, (Fig. 1.a) probably the results of drying, and the normal condition of preserved specimens.

It is thus seen that by comparing the feathering characters about the base of the bill nearly all of these species can be readily identified. With the plates this task should be easy.

FURTHER NOTES ON THE ORCHIDS OF HATLEY, STANSTEAD COUNTY, QUEBEC, 1919.

BY H. MOUSLEY.

In my last paper on the orchids of Hatley *(Ottawa Naturalist,* Vol. xxxii., 1918, No. 8, pp. 144-147*)* after recording eighteen species, I concluded by suggesting, that even then, the possibilities of the place might only have been touched upon, seeing that practically the whole of my time had been devoted to the birds, and very little attention paid to the orchids, it having taken eight years to locate the above eighteen species. Now in order to put the above suggestion to the test, and at the same time gratify a long felt wish of becoming better acquainted with the ferns of the district, I decided early in 1919, not without much deliberation however, to entirely ignore the birds after the spring migration, and devote the rest of the summer months or until such time as the fall migration set in, to the collecting of ferns, and any further species of orchids, should that indeed be possible.

The weather entirely favoured my plans, it being very hot on and off, all through June and July, with a good deal of humidity in the air, which entirely suited the orchids, many appearing in greater profusion and blooming earlier, than in previous years. Of the ferns, probably forty species have been collected, including the Adder's Tongue *(O. vulgatum)* and at least six species and forms of Botrychiums, two of which have never been found in the Province of Quebec before. These however, will be dealt with in a separate paper, when they have been further critically examined.

Now I have noticed in some of the text books, that it is a moot point in many localities, as to which of the three following orchids is the earliest bloomer, namely, *Cypripedium acaule, Orchis spectabile* or *Calypso bulbosa.* There need be no mystery concerning this at Hatley, for it is certainly the lovely little Calypso, which was much more plentiful in 1919 than in the year previous. As regards the showy Lady's Slipper *(C. hirsutum),* I am glad to say after the disaster that overtook the species in 1918 (as previously described), it was found this year growing in greater profusion than ever, one little patch alone containing forty-one blooms, whilst another close to, had seventeen. I only found a few plants, however, with more than one bloom, three blooms being the most in any case. Four snow-white blooms of the Mocassin or Pink Lady's Slipper *(C. acaule)* were noted. Of the Habenarias, I came across one very large plant of the Tall Leafy Green Orchis *(H. hyperborea),* the height of which including the raceme was 9.5 dm., the raceme being 3 dm. I have noticed the larger plants of this *Habenaria,* bloom much earlier as a rule than the smaller ones, and grow in certain localities only. Can it be that they belong to a distinct species?, a contingency not altogether unlikely in *hyperborea,* which is supposed by some authors to include several species.

With the exception of the Wide-leaved Ladies Tresses *(Spiranthes lucida),* I have this year (1919) found all of the other seventeen species enumerated in my previous paper, besides adding another twelve. It will thus be seen, that my total now stands at thirty species and forms of these rare and interesting plants that I have located at Hatley, or considerably more than one-third of all those to be found in eastern North America, and all have been gathered within a space of four square miles. The record for the Gray's Manual area has been made in the State of Vermont I believe, where

thirty-three species of orchids have been collected in a given space of five square miles. This being so, it looks as though I can now safely lay claim to second honours for the Province of Quebec.

Appended is an annotated list of the twelve new species found this year (1919), as well as an abbreviated one, for the benefit of those wishing to see at a glance, the total number of orchids, approximate dates when, and number of stations at which, they have been found.

LARGE ROUND-LEAVED ORCHIS, *Habenaria orbiculata* (Pursh) Torr. I first came across this orchid on June 8, four plants in leaf only being found at this date. On subsequent visits, however, I increased this number to eleven, but none of these bloomed, with the exception of one, which when I went to gather it the first time, was not quite fully out. Returning a few days later, I was disappointed to find that the flower had been eaten off, probably by some cows, of which there were a good many grazing in the immediated neighbourhood. Most of the plants were growing under hemlock trees, in company with *C. acaule* and *E. tesselata*.

Habenaria macrophylla Goldie. In addition to the eleven plants mentioned above, were two with very much larger leaves than any of the others. Fortunately one of these bloomed, and I think I am justified in recording it as *macrophylla*, for in addition to the size of its leaves, the scape was 41 cm. high, and none of the spurs were less than 3 cm. long, both of these dimensions considerably exceeding those given in Gray's Manual for *orbiculata*. The raceme was 11 cm. long and 5 cm. through, and held fourteen flowers. I first found this particular plant on June 13, the scape then being 18 cm. high, which had increased to 28 cm. by June 22. It was not, however, until the beginning of July, that its full height of 41 cm. was attained, and by the thirteenth, all the fourteen flowers were fully developed, making it, if not exactly a showy, still a fine, and uncommon looking plant, in my opinion.

x *Habenaria Andrewsii*, White. I have no vernacular name for this supposed hybrid between *H. psycodes* and *H. lacera*. I first came across it on July 26, when I found one perfectly white bloom, and one almost so, the top of the raceme only being suffused with pink. They puzzled me at the time, but I entered the record in my Gray's Manual under the above, with a note of interrogation, however, scarcely believing that they could be *Andrewsii*, seeing that there were no *H. lacera* about. Fortunately about a week after, I had the pleasure of Mr. Ludlow Griscom's company for a few days botanizing, and on August 3, he came across another plant, which also puzzled him. However, on taking it home and critically examining it, he came to the conclusion that it was really *Andrewsii*, and on submitting it to Mr. Oakes Ames, his identification was confirmed, Mr. Ames at the same time questioning the correctness of regarding it as a hybrid between *H. psycodes* x *lacera*. I understand the plant has been found commonly in Newfoundland, which has also aroused suspicion as to its being a hybrid between *H.psycodes* x *lacera*. It may be of interest to here give Mr. Oakes Ames' exact label of determination of the above specimen, which is as follows, viz.: "*Habenaria Andrewsii* White? The divisions of the labellum not as deeply fringed as in Andrew's specimens from Vermont. This specimen is more like material from Newfoundland (Fernald and Wiegand 5216). The raceme of this specimen is rather characteristic of the hybrid. It may be convenient to regard it as of hybrid origin, with *psycodes lacera* parentage!" It seems obvious from this comment, that my failure to find *lacera* anywhere in the district, is an interesting piece of evidence.

LARGE PURPLE FRINGED ORCHIS, *Habenaria fimbriata* (Ait) R. Br. It was not until July 10, that I came upon a colony of these delicate belles of the swamp, as Thoreau calls them, alluding to the peculiar charm of the pale pink flowers. The larger, paler flowered, and usually more open raceme, distinguishes this species from its cousin *H. psycodes*, besides which it generally occurs in more shady situations than the latter. One very fine plant that I found, had a total height of 9.5 dm., the raceme being 18 cm. long by 5 cm. through, and the four large leaves were 16-18 cm. long by 6-10 cm. broad. My dates for fresh blooms, range from the tenth to about the middle of July, but judging from the condition of those on the tenth, it is evidently to be found somewhat earlier.

GRASS PINK, *Calopogon pulchellus* (Sw.) R. Br. The peculiarity of this lovely magenta crimson orchid, consists in its not having the ovary twisted, so that consequently the lip is on the upper, instead of the lower side of the flower. Apparently it is rare at Hatley, for I have only found one station for it so far, in the large bog to the north-east of the village, and then only a very few plants could be located. It was in bloom from July 8-15.

SLENDER LADIES' TRESSES, *Spiranthes gracilis* (Bigel) Beck. This slender little orchid like the Grass Pink, is apparently rare here, only one sta-

tion with three plants having so far been discovered. Two of these were found on July 16, and the remaining one on July 25, but they were not in bloom until August 3. The situation consisted of some very dry hilly knolls, on the outskirts of a large wood, and I am not likely to forget the day, seeing that at the same time I also discovered the Green Adder's Mouth *(Microstylis unifolia)*, and those rare little ferns the Adder's Tongue *(Ophioglossum vulgatum)*, and Little Grape Fern *(Botrychium simplex)*, the dry location for these three latter, being somewhat uncommon, as they generally occur in damper situations as a rule.

HODDIGES RATTLESNAKE PLANTAIN, *Epipactis tesselata* (Lodd) A. A. Eaton. I really found this orchid away back in 1915, but as it was not then in bloom, and I was unacquainted with the difference in the shape, size, and colouring of its leaves, to those of *E. repens*, I passed it over, and took it for the latter species. However in the fall of 1918, I came across a few dead scapes, which by their size and height, struck me at once as not being *repens*, but something new. This idea was further strengthened in the following spring, when the difference in the leaves was noticed, and later in July when the flowers appeared, all doubt was at an end, as they were then seen to be the present species, and not *repens*.

HEART-LEAVED TWAYBLADE, *Listera cordata* (Lin.) R. Br. This little orchid even if it were common, would nevertheless be hard to find, owing to its small size, and inconspicuous madder-purple flowers. I first came across it on June 8, of the present year (1919), growing amongst spagnum moss, in a damp wood to the north-west of the village, and again on July 8, in the large bog to the north-east of the village, and yet again on August 4 (one plant only), in the woods surrounding the great Brulé bog near Waterville, some miles also to the north-east of Hatley. In the first mentioned locality, I found bunches of eight, ten, nineteen, and in one case as many as twenty-seven plants, all growing somewhat closely together. In two cases, there was a small bract leaf (the same as often occurs in *H. obtusata*), at the base of the raceme, and in a few the lip was devoid of madder-purple, this giving the whole raceme a green appearance. My dates for fresh blooms, range from June 8 to July 3. In "THE CANADIAN NATURALIST," 1840, pp. 297-303, Gosse gives a good account of the Brulé, describing it as exactly resembling the bogs of Newfoundland. It consists of some thousands of acres, and is said to owe its origin to the beavers, which were formerly numerous, damming up the streams, which overflowing and spreading over the flat lands, killed the growing timber. When Mr. Griscom and I visited it for the first time, on August 4, we both came to the conclusion, that there were great possibilities regarding the place. Seven different orchids were found, even at this somewhat late date, as well as many of the plants, shrubs and trees, mentioned by Gosse as growing in similar situations in Newfoundland, including black spruce, which I had not noticed here before. It is hoped to again visit the locality early in June, when good results are expected, especially in regard to the orchids, of which our trip in August gave promise.

LARGE CORAL ROOT, *Corallorrhiza maculata* Raf. It was not until August 9, that I came upon a little colony of this species, consisting of forty plants, the blooms of which were over of course, but the fruit still remained. They were found growing in a small cedar wood, on some dry sloping ground, about two miles to the south-east of the village. Later on, or on August 21, another plant was shown to me on the roadside, some few miles to the north of the present site, but also on the east of the village.

WHITE ADDER'S MOUTH, *Microstylis monophyllos* (Linn) Lindl. This rare little orchid like many others, is easily passed over, unless you are specially looking for it, which no doubt accounts for my having found it during the present season (1919), when all my energies were devoted to the fern and orchid families, instead of the birds. The situation was a low damp one, at the edge of a little wood, where twenty-four plants were located. Later on I found one other plant in a similar situation, two miles to the north-west of the village, whereas the first locality was two miles to the south-east of it. The plants were just in their prime on June 30, the day on which I found them.

GREEN ADDER'S MOUTH, *Microstylis unifolia* (Michx) B.S.P. This is another somewhat inconspicuous little plant, but is much commoner than *monophyllos*, there being at least five stations at which I have found it, and generally in somewhat goodly numbers. Its habitat seems to vary a good deal, the situation sometimes being very dry, as already mentioned in the account of the Slender Ladies' Tresses, and at others very damp, the same as those favoured by *monophyllos*.

LOESEL'S TWAYBLADE, *Liparis Loeselii* (Linn) Richard. This is another of those somewhat inconspicuous little orchids, and one which I must have passed over many times, before finally noticing it in bloom, on July 12 of the present year (1919). It certainly favours very wet boggy places, especially those where the water drains out of the land, at the foot of hill-sides. At present I have located about four stations, where its numbers vary considerably, from three plants in one, to some dozens in another. My data for fresh blooms range from June 27 to July 5.

List of the orchids of Hatley, with approx. stations, and dates of flowering.

Stations	Species	Flowering
3	*Cypripedium parviflorum*	May 29-June 10
3	do do var *pubescens*	May 28-June 18
2	*Cypripedium hirsutum*	June 14-July 17
8	do *acaule*	May 24-June 18
4	*Orchis spectabilis*	June 1
4	*Habenaria bracteata*	May 20-June 11
Many	do *hyperborea*	May 31-July 25
2	do *dilatata*	June 18-July 26
Many	do *obtusata*	June 8-July 17
2	do *orbiculata*	July 8
1	do *macrophylla*	July 13
Many	do *psycodes*	July 19-Aug. 15
2	do *Andrewsii*	July 26-Aug. 3
2	do *fimbriata*	July 10-17
1	*Calopogon pulchellus*	July 8-15
1	*Arethusa bulbosa*	June 11-July 17
1	*Spiranthes lucida* (three plants only)	Aug. 3
1	*Spiranthes lucida* (one plant only)	July 20
Many	*Spiranthes cernua*	Aug. 17-Oct. 17
Many	do *Romanzoffiana*	July 16-Aug. 22
4	*Epipactis repens* var *ophioides*	July 22-Aug. 22
4	*Epipactis tesselata*	July 8-Aug 2
3	*Listera cordata*	June 8-July 3
6	do *convallariodes*	June 18-July 17
Many	*Corallorrhiza trifida*	May 20-June 15
2	do *maculata*	Aug. 9 (in seed)
2	*Microstylis monophyllos*	June 30-July 4
5	do *unifolia*	July 12-Aug. 3
4	*Liparis Loeselii*	June 27-July 5
1	*Calypso bulbosa*	May 15-28

AN ANNOTATED LIST OF THE BIRDS OF COLDSTREAM, ONTARIO, VICINITY.

BY A. A. WOOD.

1. HOLBOELL'S GREBE. *Colymbus holboelli.* One shot, Oct. 6, 1902, on Duncrief pond—four miles north of Coldstream—by Roger T. Hedley. The specimen is in my collection, No. 1,402.

2. HORNED GREBE, *Colymbus auritus.* A few stop on the mill-pond nearly every spring; only an occasional one seen in fall. They seem much friendlier than the Pied-bill, while here, especially when a single bird comes. If you sit quietly at edge of pond, it will swim within a few feet of you then fly to other end of pond, only to drift back again. It will repeat this several times, uttering its plaintive cry at intervals.

3. PIED-BILLED GREBE, *Podilymbus podiceps.* A pair bred here quite regularly previous to 1904: rather rare now in spring; common and regular in fall.

4. LOON, *Gavia immer.* A single bird seen every three or four years in spring; rare in fall.

5. HERRING GULL, *Larus argentatus.* A few small flocks pass through each spring and fall, some resting on the pond a few hours. I think the birds that touch here are passing between Lakes Huron and Erie. Coldstream is about in a straight line between Grand Bend and Pt. Stanley making it nearly a fifty mile flight direct.

6. BONAPARTE'S GULL, *Larus philadelphia.* Two came in spring of 1900. One was shot. Have a specimen taken by R. T. Hedley, at Duncrief, Apr. 26, 1902.

7. COMMON TERN, *Sterna hirundo.* I have two specimens shot by R. T. Hedley at Duncrief; the first, I believe to be taken in Middlesex.

8. BLACK TERN, *Hydrochelidon nigra surinamensis.* One specimen in my collection taken by R. T. Hedley at Duncrief—also a first record for this county.

9. MERGANSER, *Mergus americanus.* A few stay in the open rapids of the creek every other year, through January and February often they will walk away from the water in the snow considerable distances.

10. HOODED MERGANSER, *Lophodytes cucullatus.* Not regular. Have taken them both spring and autumn.

11. MALLARD, *Anas platyrhynchos.* Very irregular; more seen at Duncrief.

12. BLACK DUCK, *Anas rubripes.* Fairly common migrant. A flock of nearly 200 stayed in a slough, two miles south, about two weeks in August, 1917. The flocks very seldom come to the ponds; they seem to like the little sloughs back in the fields, especially late in the season.

13. GREEN-WINGED TEAL, *Nettion carolinense.* I have never seen them near in spring; always a few come through in the fall.

14. BLUE-WINGED TEAL, *Querquedula discors.* Not as ommon as the Green-wing.

15. SHOVELLER, *Spatula clypeata.* Only one specimen noted.

16. WOOD DUCK, *Aix sponsa.* Very rare now. Ocasionally one or two stop at Komoka—eight miles south.

17. REDHEAD, *Marila americana.* Frequently one is met with in fall along with the Teals.

18. SCAUP DUCK, *Marila marila.* R. T. Hedley has a specimen he took at Duncrief, which, the late Robert Elliott of Plover Mills, Ont., identified as *M. marila.*

19. LESSER SCAUP DUCK, *Marila affinis.* Regular spring and fall visitor. The latest spring record I have is May 10, 1916.

20. GOLDEN-EYE, *Clangula clangula.* Nearly always appears spring and fall. Ocassionally stays on the creek with the Mergansers. A flock of 20 came to the pond one fall.

21. BARROW'S GOLDEN-EYE, *Clangula islandica.* I have a young male I shot here October 17, 1917. The only Golden-eye seen with the cresent spot.

22. BUFFLEHEAD, *Charitonetta albeola.* Our commonest duck. They usually stay a day or two if unmolested.

23. OLD SQUAW, *Harelda hyemalis.* A male in full plumage was taken at the Duncrief pond by R. T. Hedley.

24. KING EIDER, *Sometaria spectabilis.* One taken at Duncrief by R. T. Hedley, November 24, 1900; the first Middlesex record. The specimen is in the collection of W. E. Saunders, of London.

25. WHITE-WINGED SCOTER, *Oidemia deglandi.* I have a specimen taken by R. T. Hedley, at Duncrief.

26. RUDDY DUCK, *Erismatura jamaicensis.* Rare fall migrant.

27. CANADA GOOSE, *Branta canadensis.* Abundant migrant. Sometimes feeding on the wheat fields in spring.

28. AMERICAN BITTERN, *Botaurus lentiginosus.* Always present during the breeding season. They have their eggs laid by June 3.

29. LEAST BITTERN, *Ixobrychus exilis.* Took one September 13, 1917, the only individual I have seen near Coldstream.

30. GREAT BLUE HERON, *Ardea herodias.* There is a black ash swamp 2½ miles east, where about 22 pairs have nested for years. The majority of the nest-trees are very tall dead ashes standing in water; in most cases next to impossible to reach. A set of six was taken from there by Clifford Zavitz, May 10, 1901; incubation was very far advanced, as they are through laying the last week in April. There is always a pair of Great Horned Owls staying there, as well as in the heronry north of here. A heron has spent the winter along the creek several times.

31. GREEN HERON, *Butorides virescens.* A pair nest here regularly. Four nests observed were—two in cedar, one in aspen and one in hawthorn, all quite near the creek. Last year the crows destroyed one set of five. Four more were laid in the same nest.

32. VIRGINIA RAIL, *Rallus virginianus.* Rather scarce. Usually a pair breeds. I found the young birds one season; have sets of nine and ten eggs.

33. SORA, *Porzana carolina.* At least one pair seen each year. In one nest containing fifteen eggs, they were piled up in two layers.

34. COOT, *Fulica americana.* Occasionally breeds, but much more frequently seen in the fall.

35. WOODCOCK, *Philohela minor.* Scarce now but a pair always breeds. Young birds seen quite regularly. I saw a nest with four infertile eggs, May 10, 1915. The bird allowed me to stroke her head before leaving. Evidently just the female was present that year, as during repeated waits in early April, no notes were heard from the male. Just the one bird was seen all season.

36. WILSON'S SNIPE, *Gallinago delicata.* Common spring and fall.

37. KNOT, *Tringa canutus.* Two birds were found dead under telephone wires, about eight and one-half miles south. They are mounted and in the possession of Mr. Knolls, Delaware.

38. PECTORAL SANDPIPER, *Pisobia maculata.* One specimen in my collection taken by R. T. Hedley, at Duncrief, Ont., October 18, 1901.

39. LEAST SANDPIPER, *Pisobia minutella.* Commonest in late July and early August.

40. RED-BACKED SANDPIPER, *Pelidna alpina.* Two came to the pond, October 15, 1917. Secured one specimen. These are the only ones noted.

41. SEMI-PALMATED SANDPIPER, *Ereunetes pusillus.* Frequently seen with Least Sandpiper.

42. GREATER YELLOW-LEGS, *Totanus melanoleucus.* A few each spring. Quite common in the fall.

43. LESSER YELLOW-LEGS, *Totanus flavipes.* Not so regular as *melanoleucus.*

44. SOLITARY SANDPIPER, *Helodromas solitarius.* Irregular in spring, but always a few in August.

45. UPLAND PLOVER, *Bartramia longicauda.* Several pairs nest regularly in the large grass fields. W. R. Campbell, of Lobo, has a set of four taken in May, 1914. I have a set of four found on June 3, 1915. Both birds flushed hard from the nest; the one in June, 1915, did not leave until grass-tuft around the nest was touched (and these were fresh eggs). While searching for the last mentioned nest, two birds continually circled over the field giving their odd rattling notes. We thought at the time they were the pair from the nest but on finding a bird setting, concluded, there must have been two occu-

pied nests and that these were the two males—or the two birds off duty from the nests.

46. SPOTTED SANDPIPER, *Actitis macularia.* Common summer resident. An instance which might suggest that the number of eggs in a set is, perhaps, in a small measure voluntarily under control of the bird is the following: A pair of these birds were excavating the slight depression necessary for their nest; when they came to a stone practically the same size as an egg, they left this and built the nest around it, then laid three eggs which, with the stone, formed the perfect circle usual with the four eggs. I think if the stone had been removed at first, they would have laid the usual set of four, as I have never found a nest with other than four eggs.

47. BLACK-BELLIED PLOVER, *Squatarola squatarola.* Six were shot several years ago.

48. GOLDEN PLOVER, *Charadrius dominicus.* Two specimens in my collection taken by R. T. Hedley, at Duncrief, September 19, 1904.

49. KILLDEER, *Oxyechus vociferus.* Common summer resident.

50. SEMI-PALMATED PLOVER, *Aegialitis semipalmata.* Took one at Duncrief, July 29, 1918.

51. BOBWHITE, *Colinus virginianus.* Becoming exceeding scarce; rarely seen now. A number of years ago they bred quite commonly.

52. RUFFED GROUSE, *Bonasa umbellus.* Quite scarce in the township now.

53. MOURNING DOVE, *Zenaidura macroura.* Very generally distributed. I have found fresh eggs from the last week in April until the third week in June.

54. TURKEY VULTURE, *Cathartes aura.* Three pair bred in the vicinity every year. Four nests noted were all in hollow logs. W. R. Campbell took a set of one, May 18, 1919; it was in a hollow of the rotton wood, about twelve feet from opening, very difficult to see from end of log. Egg far advanced.

55. MARSH HAWK, *Circus hudsonius.* Breeds here regularly. See more of the "blue" males than formerly.

56. SHARP-SKINNED HAWK, *Accipiter velox.* A few seen every spring and fall, but only ocasionally in summer.

57. COOPER'S HAWK, *Accipiter cooperi.* Only one or two observed each season.

58. GOSHAWK, *Astur atricapillus.* Occasionally comes in late fall.

59. RED-TAILED HAWK, *Buteo borealis.* Is always common in breeding season, a pair or two often staying over winter. Then, they usually nest earlier. On March 30, 1914, a nest was found with three eggs. This pair was usually resident and laid at least a week earlier than the average migrating bird. Twelve nests were noted near here in 1916.

60. RED-SHOULDERED HAWK, *Buteo lineatus.* The Red-shoulder seems to be locally distributed. It is very scarce in this part, while south and east a few miles it is commoner than the Red-tail. On May 10, 1901, C. G. Zavitz and I found a Great Blue Heron's nest containing three eggs and one Red-shouldered Hawk's egg, all equally incubated (far advanced). The Hawk doubtless had only laid one egg by the time the colony of Herons came and when it was driven out. I have found this Hawk to lay in a squirrel's nest of leaves, without adding any twigs or sticks, but never have heard of its having laid in other bird's nests.

61. BROAD-WINGED HAWK, *Buteo platypterus.* Quite abundant during migration. Very ordinary fare seems to satisfy these birds. I have found a Mole shrew, *Blarina brevicauda*, in the stomach of one specimen in the spring of 1919.

62. ROUGH-LEGGED HAWK, *Archibuteo lagopus.* Two or three are seen nearly every year.

63. BALD EAGLE, *Haliaeetus leucocephalus.* One or two seen nearly every year. A pair bred about about eight miles south in the spring of 1919.

64. SPARROW HAWK, *Falco sparverius.* Regular summer resident. Although usually subsisting on small fare, I have seen them carry off an adult robin.

65. OSPREY, *Pandion haliaetus.* Usually one or two visit the pond each spring.

66. LONG-EARED OWL, *Asio wilsonianus.* A pair breeds always in one of the cedar swamps or woods each spring. I think their average date of finishing laying is about April 1, but the crows destroy the first set more often than not. The five sets noted, which escaped destruction by crows before completion, each contained five eggs; all were in old crow's nests, no repairs evidently being made. The eggs in the early sets are laid usually at intervals of several days, so the young birds are quite noticeably different in size, especially while in the natal down. One set taken, May 1, 1916, all eggs were uniformly incubated; they may have been laid unevenly (as the bird would not have to set until through laying this time of year) but I think not as I have never found a nest with an egg in it and the bird not setting close. They apparently are much like the Great Horns, nesting at the usual time regardless of the weather. One pair had two eggs on March 31, 1903, when there was four inches of snow on the ground.

In a nest found April 24, 1917, the young birds stayed in the nest three and a half weeks. The old birds were very bold. One would alight on a limb near the next tree, flapping its wings, then fall, sometimes fifteen feet, to the ground, floundering about among the leaves as if wounded.

They seem to feed almost entirely on meadow voles and white-footed mice. In twenty disgorged pellets of fur and bones found under roost trees, 15 contained, each, skulls, etc. of two *M. pennsylvanicus*, 3, each, one *M. pennsylvanica* and 2, each, one *M. pennsylvanica* and one *P. leucopus*. When one bird is setting the other keeps a plentiful supply of mice; usually a mouse is lying on the edge of the nest.

67. SHORT-EARED OWL, *Asio flammeus*. Some autumns a few are seen, also, on through the winter.

68. SAW-WHET OWL, *Cryptoglaux acadia*. Rare only one specimen taken, November 2, 1913.

69. SCREECH OWL, *Otis asio*. Common resident.

70. GREAT HORNED OWL, *Bubo virginianus*. Several pair breed near here, laying the last week in February. On April 28, 1914, in climbing to a Great Blue Heron's nest, was surprised to find a young Horned Owl, nearly ready to fly. In a heron's nest a few rods over was another young owl. I tried this bird but it couldn't fly, so I presume the old bird must have moved the one to the second nest—perhaps when they became quarrelsome. Evidently the other nest was appropriated after the herons took possession, as a pair of herons were building a new nest; the other 21 were all occupied. The owls were nearly in the centre of the heronry. I took three specimens in the spring of 1918 which I think are a phase of *subarcticus*.

71. SNOWY OWL, *Nyctea nyctea*. Very seldom seen, more commonly appearing a few miles north.

72. YELLOW-BILLED CUCKOO, *Coccyzus americanus*. Common; breeds.

73. BLACK-BILLED CUCKOO, *Coccyzus erythropthalmus*. Common; breeds.

74. BELTED KINGFISHER, *Ceryle alcyon*. Has stayed over winter.

75. HAIRY WOODPECKER, *Dryobates villosus*. *T. v. villosus* seems to be the common winter form.

76. DOWNY WOODPECKER, *Dryobates pubescens*. Is commoner than the Hairy woodpecker. Several present at all seasons.

77. ARCTIC THREE-TOED WOODPECKER, *Picoides arcticus*. W. R. Campbell took a male in 1913 and I a female, Nov. 20, 1918, the only two I have seen.

78. YELLOW-BELLIED SAPSUCKER, *Sphyrapicus varius*. Regular migrant.

79. PILEATED WOODPECKER, *Phocotomus pileatus*. Two pair nest regularly a few miles southwest of here. One dead beech stub has three nest-holes about three or four feet apart. The lowest forty-five feet from ground.

80. RED-HEADED WOODPECKER, *Melanerpes erythrocephalus*. Not nearly so common as formerly. Winters over in years the beech-nuts are plentiful. They seem to nest earlier those years.

81. RED-BELLIED WOODPECKER, *Centurus carolinus*. A few pair resident; but used to be much more common. A nest May 7, 1913, contained two fresh eggs.

82. FLICKER, *Colaptes auratus*. Very common. An occasional bird staying through the winter.

83. WHIP-POOR-WILL, *Anthrostomos vociferus*. Quite regular, never very many.

84. NIGHTHAWK, *Chordeiles virginianus*. Always several pairs. Found a nest June 4, 1918, near edge of a small wood. The eggs were laid in the imprint of someone's heel in the earth, only one small leaf under eggs.

85. CHIMNEY SWIFT, *Chaetura pelagica*. They seem to build in silos, granaries, or in barns on the siding as often as in chimneys.

86. RUBY-THROATED HUMMINGBIRD, *Archilochus colubris*. Breeds. Is quite abundant along the borders of swamps when the spotted jewel-weed *(Impatiens biflora)* is in bloom.

87. KINGBIRD, *Tyrannus tyrannus*. Common; breeds.

88. CRESTED FLYCATCHER, *Myiarchus crinitus*. Fairly common; breeds.

89. PHOEBE, *Sayornis phoebe*. Very common; breeds.

90. OLIVE-SIDED FLYCATCHER, *Nuttallornis borealis*. Only three individuals seen.

91. WOOD PEWEE, *Myiochanes virens*. Common; breeds.

92. YELLOW-BELLIED FLYCATCHER, *Empidonax flaviventris*. Rare. One taken May 28, 1919.

93. ALDER FLYCATCHER, *Empidonax trailli*. Two *E. t. alnorum* taken May 10, 1918. Not more than one or two seen in the spring.

94. LEAST FLYCATCHER, *Empidonax minimus*. Common in migration. Only a very few seem to breed here.

95. PRAIRIE HORNED LARK, *Otocoris alpestris*. *O. a. praticola* is a common resident, raising two broods a season. It seems more abundant in winter owing to its being in flocks. Took an albino female June 11, 1917.

96. BLUE JAY, *Cyanocitta cristata*. Resident. They gather in the Cedar swamps in the late fall and eat large quantities of Skunk Cabbage (*Symplocarpus foetidus*) seeds.

97. CROW, *Corvus brachyrhynchos*. Abundant resident; sometimes rather scarce in winter. Their chief form of recreation seems to be making life miserable for the Horned Owls. Yet they prove an effectual body guard, when the owl is pursued with a gun, always getting him in motion in plenty of time.

98. BOBOLINK, *Dolichonyx oryzivorus.* Very common summer resident.

99. COWBIRD, *Molothrus ater.* Much too abundant. Most of the small birds are burdened with the rearing of it's offspring.

100. RED-WINGED BLACKBIRD, *Agelaius phoeniceus.* Breeds in most of the cat-tail runs, also building in the wild Red Osier, *Cornus stolonifera,* and sedge grasses.

101. MEADOWLARK, *Sturnella magna.* Common; breeds. Sometimes few stay over winter.

102. ORCHARD ORIOLE, *Icterus spurius.* One noted in song May 31, 1917.

103. BALTIMORE ORIOLE, *Icterus galbula.* Common, breeds.

104. RUSTY GRACLE, *Euphagus carolinus.* Common migrant. More abundant in fall.

105. BRONZED GRACLE, *Quiscalus quiscula.* Abundant summer resident. Occasional birds staying in winter. Is in rather poor grace with the farmers of this locality, through it's love for sprouting corn, yet I think they receive much more benefit than harm from the bird.

106. PINE GROSBEAK, *Pinicola enucleator.* A number were here through the winter of 1918-19 They seemed to feed largely on apple seeds.

107. PURPLE FINCH, *Carpodacus purpureus.* They seem to be great wanderers, as there are long stretches at a time through the winter when they are entirely absent.

108. CROSSBILL, *Loxia curvirostra.* Three seen Feb. 14, 1918.

109. WHITE-WINGED CROSSBILL, *Loxia leucoptera.* Saw six Nov. 18, 1917.

110. REDPOLL, *Acanthis linaria.* Some winters quite abundant, but usually only a very few seen, or entirely absent.

111. GOLDFINCH *Astragalinus tristis.* Abundant resident. Found commonest in winter on the Black Birch, *Betula lenta.* Feeds on the catkins.

112. PINE . SISKIN, *Spinus pinus.* Occasional small flocks met with in fall.

113. SNOW BUNTIHG, *Plectrophenax nivalis.* Abundant winter visitor.

114. VESPER SPARROW, *Pooecetes gramineus.* Very common; raising two and three broods a season.

115. SAVANNAH SPARROW, *Passerculus sandwichensis.* Common summer resident.

116. GRASSHOPPER SPARROW, *Ammodramus savannarum.* Regular summer visitor. Have heard them in song up to the last week in July.

117. WHITE-CROWNED SPARROW, *Zonotrichia leucophrys.* Always present in spring and fall migrations.

118. WHITE-THROATED SPARROW, *Zonotrichia albicollis.* Abundant in spring and fall. Have never observed it during the breeding season.

119. TREE SPARROW, *Spizella monticola.* Common winter resident; remaining until the second week in April

120. CHIPPING SPARROW, *Spizella passerina.* Very common; breeds.

121. FIELD SPARROW, *Spizella pusilla.* Very few here. Common four miles south-west.

122. SLATE-COLORED JUNCO, *Junco hyemalis.* Abundant in spring and fall; a very few remaining to breed. Always quite a number present through the winter.

123. SONG SPARROW, *Melospiza melodia.* Very abundant summer resident. A few spend the winter.

124. LINCOLN'S SPARROW, *Melospiza lincolni.* Saw three Oct. 3, 1917. Took one specimen. They did not skulk through the grass, as I had expected, but stayed in the low dog-wood bushes which margined the pond.

125. SWAMP SPARROW, *Melospiza georgiana.* Breeds sparingly here each season.

126. FOX SPARROW, *Passerella iliaca.* Five to ten seen each migration.

127. TOWHEE, *Pipilo erythrophthalmus.* Common. A few wintered here the season of 1917-18.

128. CARDINAL, *Cardinalis cardinalis.* One taken May 3, 1918. The first to be observed. Another heard July 8, 1918.

129. ROSE-BREASTED GROSBEAK, *Zamelodia ludoviciana.* Common; breeds.

130. INDIGO BUNTING, *Passerina cyanea.* A pair breeds in nearly every large raspberry patch.

131. SCARLET TANAGER, *Piranga erythromelas.* Common. Took a beautiful male June 3, 1918, half way between summer and winter plumage, yet it was full—no pin-feathers. The underparts were color of the female with heavy, clear-cut blotches of scarlet. Crown, nape and back, variegated with scarlet and green, darker than crown of female.

132. PURPLE MARTIN, *Progne subis.* Only one seen—June 1, 1918.

133. CLIFF SWALLOW, *Petrochelidon lunifrons.* Occassionally a colony attempts to build under the eaves of a barn, but are usually driven out by House Sparrows.

134. BARN SWALLOW, *Hirundo erythrogaster.* Common; breeds.

135. TREE SWALLOW, *Iridoprocne bicolor.* Regular migrant; few nesting.

136. BANK SWALLOW, *Riparia riparia.* A few breed in most of the gravel-pits. Larger colonies in the sand-banks along the creek.

137. ROUGH-WINGED SWALLOW, *Stelgidopteryx serripennis.* Becoming commoner. Several pair nest each season. Eggs are laid early in the second week in June. All nests I examined contained six eggs.

138. CEDAR WAXWING, *Bombycilla cedrorum.* Resident, but very uncertain in winter, sometimes not noted until spring.

139. NORTHERN SHRIKE, *Lanius borealis.* Usually one each fall or winter.

140. MIGRANT SHRIKE, *Lanius ludovicianus* A pair or two always nested, but none seen near since 1918.

141. RED-EYED VIREO, *Vireosylva olivacea.* Common summer resident. Last spring (June 8, 1918) I noticed a Red-eye excited over something, then saw a chipmonk climbing the sapling the bird was in. When he was about eight feet up, the vireo darted down knocking him to the ground. The other bird was on the nest at the end of one of the branches. The nest contained four cowbird's eggs and one of their own, so little was gained in keeping the chipmonk away.

142. PHILADELPHIA VIREO, *Vireosylva philadelphica.* Appears sparingly early in he last week of May.

143. WARBLING VIREO, *Vireosylva gilva.* Three or four pair breed in the village every summer.

144. YELLOW-THROATED VIREO, *Lanivireo flavifrons.* A regular summer resident.

145. BLUE-HEADED VIREO, *Lanivireo solitarius,* Usually from one to six seen each spring and fall.

146. BLACK AND WHITE WARBLER, *Mniotilta varia.* Common migrant. Very seldom seen during nesting season.

147. GOLDON-WINGED WARBLER, *Vermivora chrysoptera.* A pair regularly breeds near here, May 18, 1919, saw five.

148. NASHVILLE WARBLER, *Vermivora rubricapilla.* Never abundant. A few seen each spring.

149. ORANGE-CROWNED WARBLER, *Vermivora celata.* Only one positively identified, a male, May 9, 1918.

150. TENNESSEE WARBLER, *Vermivora peregrina.* Fairly well represented from May 15 to 25. Always a few in fall.

151. PARULA WARBLER, *Compsothlypis americana.* Have only observed it in spring.

152. CAPE MAY WARBLER, *Dendroica tigrina.* Arrives about May 6. Usually see from two to six each spring; one or two in the fall.

153. YELLOW WARBLER, *Dendroica aestiva.* Very common summer resident.

154. BLACK-THROATED BLUE WARBLER, *Dendroica caerulescens.* Common migrant spring and fall.

155. MYRTLE WARBLER, *Dendroica coronata.* Abundant migrant.

156. MAGNOLIA WARBLER, *Dendroica magnolia.* Common, spring and fall.

157. CERULEAN WARBLER, *Dendroica cerulea.* Arrives about May 13. Breeds in a number of nearby woods.

158. CHESTNUT-SIDED WARBLER, *Dendroica pensylvanica.* Very common during migration, but only a few remaining to breed. Found two pair building June 13, 1918.

159. BAY-BRESTED WARBLER, *Dendroica castanea.* Always quite a number in spring, the females arriving nearly a week later than the males. Have never taken it in autumn.

160. BLACK-POLL WARBLER, *Dendroica striata.* Regular, spring and fall, but in no great numbers.

161. BLACKBURNIAN WARBLER, *Dendroica fusca.* Very abundant migrant. Spring stay is about May 12-29.

162. BLACK-THROATED GREEN WARBLER, *Dendroica virens.* Very regular in spring and fall.

163. PALM WARBLER, *Dendroica palmarum.* Most common in fall. All specimens I have examined were *D. p. palmarum.*

164. PRARIE WARBLER, *Dendroica discolor.* On the evening of May 20, 1919, C. H. Zavitz, of Coldstream told me of seeing a warbler in an orchard which he took to be the Prairie. I was on the ground at sunrise the next morning and secured a male, the only record for here.

165. OVENBIRD, *Seiurus aurocapillus.* Common; breeds in most of the woods.

166. WATER-THRUSH, *Seiurus noveboracensis.* Always a few each spring; have never heard them in June. May 8, 1917, I took a water-thrush which agrees perfectly in measurements and color with *S. n. notabilis.* My other skins fit *noveboracensis* fairly well.

167. CONNECTICUT WARBLER, *Oporornis agilis.* Usually see two or three each spring in the woods or mixed swamps.

168. MOURNING WARBLER, *Oporornis philadelphia.* Always several each spring, but usually only a pair stay to breed.

169. MARYLAND YELLOW-THROAT, *Geothlypis trichas.* Several pair breed.

170. YELLOW-BREASTED CHAT, *Icteria virens.* One taken here on May 14, 1918, by Hoyes Lloyd. The only record.

171. WILSON'S WARBLER, *Wilsonia pusilla.* Occurs sparingly as a migrant.

172. CANADA WARBLER, *Wilsonia canadensis.* Common migrant.

173. REDSTART, *Setophaga ruticilla.* Common during migration; quite a number breed.

174. PIPIT, *Anthus rubescens.* Occurs both spring and fall but very irregular; always in flocks.

175. CATBIRD, *Dumetella carolinensis.* Very common summer resident. W. R. Campbell records one as wintering season of 1918-19.

176. BROWN THRASHER, *Toxostoma rufum.* Common. Eggs laid about May 10.

177. CAROLINA WREN, *Thryothorus ludovicianus.* A male came in spring of 1916; was in full song until August.

178. HOUSE WREN, *Troglodytes aedon.* Very common; breeds nearly as often in old stumps in clearings as about farm-buildings.

179. WINTER WREN, *Nannus hiemalis.* Have only found it as a migrant in spring and fall; is fairly common.

180. SHORT-BILLED MARSH WREN, *Cistothorus stellaris.* Have observed it but twice locally; took a specimen Sept. 2, 1916; saw another June 5, 1917.

181. BROWN CREEPER, *Certhia familiaris.* Usually resident. Absent winter of 1918-19. There is usually one to be seen in a mixed flock of chicadees, nuthatches and downy-woodpeckers.

182. WHITE-BREASTED NUTHATCH, *Sitta carolinensis.* Common resident.

183. RED-BREASTED NUTHATCH, *Sitta canadensis.* Quite common in spring and fall of some years; during others nearly absent.

184. CHICKADEE, *Penthestes atricapillus.* Common resident; nesting early in May.

185. GOLDEN-CROWNED KINGLET, *Regulus satrapa.* Ordinarily fairly common all winter and spring, but the last two winters (1917-18, 1918-19) entirely absent. Only one individual seen each spring.

186. RUBY-CROWNED KINGLET, *Regulus calendula.* Regular migrant.

187. BLUE-GRAY GNATCATCHER, *Poliophila caerulea.* Rare; only two noted.

188. WOOD THRUSH, *Hylocichla mustelina.* Fairly common summer resident, breeding in most of the woods.

189. VEERY, *Hylocichla fuscescens.* Not as common as the woodthrush in the breeding season, but common during migration.

190. GRAY-CHEEKED THRUSH, *Hylocichla aliciae.* Rare migrant. Took a specimen May 13, 1918; saw one May 14, 1919.

191. OLIVE-BACKED THRUSH, *Hylocichla ustulata.* Common spring and autumn migrant.

192. HERMIT THRUSH, *Hylocichla guttata.* Appears in numbers both spring and fall.

193. ROBIN, *Planesticus migratorius.* Very abundant, occasional birds staying through the winter. The spring of 1915, two albinos hatched from a nest at Lobo (five miles east). One was practically white, the other had a dark head. The white one became quite tame, as food was put out for it daily. It returned the next spring, but soon disappeared, probably taken by a cat.

194. BLUEBIRD, *Sialia sialis.* Very commonly distributed. Oct. 12, 1914, I took an albino from a large flock. It is pure white with a little dusky shade on wings and tail, crown, nape and back showing very pale blue.

THREE NEW PELECYPODS FROM THE COLORADOAN OF THE PEACE AND SMOKY VALLEYS, ALBERTA*

BY F. H. MCLEARN.

The revised stratigraphy of the Cretaceous of northern Alberta is treated in recent reports of the Geological Survey of Canada.[1] To them the reader is referred for detailed lithological and structural descriptions, thicknesses, areal distribution, correlation, correlation table, faunal lists, and description of new species. A statement of the principal facts concerning the Coloradoan of the Peace and Smoky Valleys is given below and is followed by the description of three new species of pelecypods. Thanks are due to Dr. T. W. Stanton for aid in the study of the fossils.

FORMATIONS. The Colorado group of the Peace and Smoky valleys includes, in ascending order, the St. John and Dunvegan formations and the lower shale and Bad Heart sandstone members of the Smoky River formation (the age of the lower 100 feet of the upper shale member may be either Coloradoan or Montanan). The St. John consists

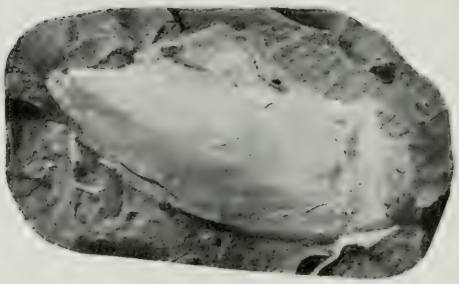
*Published with the permission of the Directing Geologist, Geological Survey of Canada.

1. McLearn, F. H., Peace River Section, Alberta, Geol. Surv., Can., Summ. Rep., 1917, C., pp. 14C-21C.

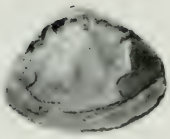
McLearn, F. H., The Cretaceous of Peace and Athabaska Valleys, in Dowling, Slipper & McLearn, Investigations in the Gas and Oil fields Alberta, Saskatchewan and Manitoba. Geol. Surv., Can., Mem. No. 116, Part III, pp. 27-33.

McLearn, F. H., Cretaceous Lower Smoky River, Alberta, Geol. Surv., Can., Summ. Rep. 1918, C., pp. 1C-7C.

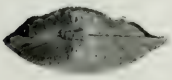
McLearn, F. H., New Species of Pelecypods from the Cretaceous of Noorthern Alberta, Geol. Surv., Can., Mus. Bull., 29, pp. 9-12, pls. 3-5.



1



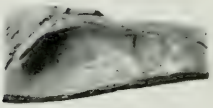
2



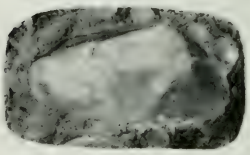
3



4



6



5



7

of marine dark shale. The Dunvegan is composed of sandstone and shale; the presence of some marine shells demonstrates temporary marine conditions, but the internal structure and nonmarine fossils indicate predominantly subaerial deposition. The Smoky River is made up chiefly of marine shale, with a marine sandstone band (Bad Heart sandstone) at or near the top of the Colorado part of the formation.

DUNVEGAN DELTA. The subaerial character of the Dunvegan and its conformable relation to marine beds above and below identify it as a delta built out into the Colorado sea. The thinning of sandstone and its replacement by shale in an easterly direction points to a western source of sediment and the existence of high land there; it also indicates that the delta was built out from the western shore. It extended at least as far east as the Athabaska in the Pelican-House River area. Southward it is not thought to have reached far, but until the Colorado group of the Brazeau-Bighorn area is studied in detail the southerly limit cannot be determined.

ZONAL ARRANGEMENT. Four fossil zones are recognized in the local development of the Colorado group. The St. John contains the first fauna with *Acanthoceras cornutum* Whiteaves, large *Inoceramus*, etc.; it may be quite early Coloradoan. A part of the base of the St. John may represent a marine equivalent of the Dakota. The second or Dunvegan fauna contains, as guide fossils, *Unio dowlingi* McLearn, *Corbula pyriformis* Meek, *Brachydontes multilinigera* Meek, *Ostrea anomioides* Meek, and *Barbatia micronema* (Meek.) The third fauna is found in the lower part of the lower shale member of the Smoky River and includes *Prionotropis hyatti* Stanton, *Acanthoceras* cf. *coloradoensis* Henderson and *Inoceramus labiatus* Schlotheim. The difference between the second and third faunas can be explained by dissimilar environmental conditions; for the Dunvegan contains freshwater, brackish water and marine sand bottom forms, while the basal Smoky River represents a shale facies with also ammonites. For the purpose of correlation they may be treated as one fauna. The fourth and highest zone, at the top of the lower shale member and in the Bad Heart sandstone member of the Smoky River, contains *Scaphites ventricosus* M. & H., *Baculites* cf. *asper* Morton, *B.* cf. *anceps* Lamarck, *Inoceramus umbonatus* M. & H., *Oxytoma nebrascana* E. & S. and *Pteria linguiformis* E. & S.

NEW SPECIES. Of the three species described below two are from the Dunvegan formation:

Tellina dunveganensis, n.sp.

Tellina (Moera) peaceriverensis, n.sp.

One is from the Bad Heart sandstone:—

Gervillia stantoni, n.sp.

Phylum MOLLUSCA.
Class PELECYPODA Goldfuss.
Order PRIONDESMACEA Dall.
Family PERNIDAE Zittel.
Genus GERVILLIA Defrance.

Gervillia stantoni, n. sp. FIG. 1.

This species is smaller and less oblique in outline than *Gervillia recta* var. *borealis* Whiteaves and *G. subtortuosa* Meek and Hayden. The size is about as in *G. recta* Meek and Hayden, but it is not nearly so oblique in outline and is wider proportionately on the hinge line.

The species name is given in honour of Doctor T. W. Stanton of the U. S. Geological Survey.

Height 40 m.m.; length 42 m.m.; length of hinge; line 35 m. m.

Horizon and Locality. Rare in the Bad Heart sandstone member of the Smoky River formation, Smoky river, Alberta.

Collection. Holotype Cat. No. 5669 in the Victoria Memorial Museum, Ottawa.

Order TELEODESMACEA Dall.
Family TELLINIDAE Deshayes.
Genus TELLINA Linné.

Tellina dunveganensis, n. sp. FIGS. 2, 4.

A trigonal, moderately depressed, shell with subcentral beaks and somewhat angular post-umbonal slope. External ligament very short; pallial sinus rounded and shallow; lateral teeth well developed and the anterior one approximate; two stout cardinal teeth in the left valve.

Height 18 m. m.; length 25 m. m.

Horizon and Locality. Rather rare in the Dunvegan formation, Peace and Smoky rivers, Alberta.

Collection. Holotype Cat. No. 5671 in the Victoria Memorial Museum, Ottawa.

Tellina (Moera) peaceriverensis, n. sp. FIGS. 5, 6.

Only molds of the left value are preserved. The outline resembles that of *Donax cuneata* Stanton, but this species is not so abruptly deflected on the postumbonal slope, is not curved upward at the anterior end, and the beak is not so prominent or terminal. *Donax? oblonga* Stanton is a larger shell with more prominent beak and is more angular and abruptly deflected on the post-umbonal slope.

The form of this species suggests the genus *Donax;* but the dentition is like *Tellina* and the outline is closest to subgenus *Moera*. The left value has two cardinal teeth, the posterior much smaller than the anterior. The lateral teeth are too well developed for *Donax;* the anterior lateral is approximate as in *Tellina*. Ligament not known.

The pallial sinus is shallow.

Height 15 m. m.; length 30 m. m.

Horizon and Locality. Rare in the Dunvegan formation, Peace river, Alberta.

Collection. Holotype Cat. No. 5670, cast of holotype No. 5670a, in the Victoria Memorial Museum, Ottawa.

EXPLANATION OF PLATE.

Figure 1.—*Cervillia stantoni* McLearn n. sp. Mold of interior of left valve. Geol. Surv., Can., Mus. No. 5669, holotype.

Figure 2.—*Tellina dunveganensis* McLearn n. sp. Largely exfoliated left valve, revealing mold of interior and showing muscle scars, pallial line and pallial sinus. Geol. Surv., Can., Mus. No. 5671, holotype.

Figure 3.—The same specimen. Shows dorsal view of both valves, with external ligament.

Figure 4.—The same specimen. Right valve.

Figue 5.—*Tellina (Moera) peaceriverensis* McLearn n. sp. Left valve, shell exfoliated, revealing mold of interior and showing muscle scars, pallial line and pallial sinus. Geol. Surv., Can., Mus. No. 5670, holotype.

Figure 6.—The same. Cast of part of left valve, showing hinge. Geol. Surv., Can., Mus. No. 5670a, cast of holotype.

Figure 7.—Smoky river at mouth of Bad Heart river. Cliff of Smoky River shale with band of Bad Heart sandstone.

OBITUARY.

LAWRENCE M. LAMBE.

By the death of Lawrence Lambe, which occurred on March 12th, 1919, the Canadian Geological Survey lost one of its best known scientists. Mr. Lambe was the Vertebrate Palaeontologist of the Geological Survey of Canada.

Lawrence M. Lambe was born in Montreal, on August 27th, 1863. His father, Wm. B. Lambe, was an Englishman who came to Canada when a young man. His mother was of Schotch descent, the daughter of Hon. Wm. Morris, of Montreal.

Lambe's college training was taken with a view to entering the profession of civil engineer. He secured shortly after his graduation from college a position with the engineers of the mountain division of the C. P. R. It is most probable that he would have remained a civil engineer but for the fact that an attack of typhoid fever compelled his return home. Although offered, after his recovery, another position on the engineering staff of the C.P.R. he preferred an appointment to the Canadian Geological Survey.

Much of Mr. Lambe's training in zoology and palaeontology was acquired chiefly through his association with that keen naturalist and palaeontologist, Dr. J. F. Whiteaves. This association began when Lambe, at the age of twenty-two, received his first appointment to the Canadian Geological Survey as artist and assistant to Dr. Whiteaves. At a considerably later period he studied with Dr. H. F. Osborne at Columbia University. Concerning this period of Mr. Lambe's career, Dr. Osborne writes as follows:—

"When I was appointed in April, 1900, on the Geological Survey of Canada, as palaeontologist, to succeed Professor Edward D. Cope, I chose Mr. Lawrence M. Lambe as my chief associate and I immediately engaged with him in the study of the fauna of the Belly River, which was published in 1902 (see Osborn *Bibliography* 1902. 217). He afterward came to Columbia University and took my full course in vertebrate palaeontology."

Analysis of Lambe's publications shows three distinct stages in his development as a scientific worker. His first three papers dealt with living marine sponges. His contributions to zoology all relate to sponges and extend over a period of thirteen years, beginning in 1892. His first contribution to invertebrate palaeontology appeared in 1896, four years after he had begun publishing on sponges. Two years later his first paper on vertebrate fossils was published. His papers published since 1900 relate with few exceptions to vetebrate palaeontology, the subject with which his name in recent years has been chiefly associated. Lambe's most important work on invertebrate fossils relates to the corals. For a short period after the death of Dr. J. F. Whiteaves, the determination of all of the palaeontological collections of the Canadian Geological Survey fell to Mr. Lambe,—a task which few palaeontologists could have ventured to undertake. After 1910, Lambe was able to devote his energies exclusively to vertebrate palaeontology. He had, too, during the later part of his career the good fortune to have the assistance of the Sternbergs who collected for him a wealth of dinosaurs and other material from the Alberta Cretaceous.

Lambe's interest centered in the office elaboration and description rather than in the collection of fos-

sils. Being an accomplished artist, he took the greatest care in supervising the execution of the drawings which illustrated the remarkable series of fossils which he has described during the last eight years. Among these were the first specimens of horned dinosaurs which had ever been found showing the character of the skin. The vertebrate fauna described by Lambe included many enormous heavy boned reptilian creatures of most fantastic appearance. One of these which bears the name of *Styracosaurus albertensis* possessed a skull six feet in length. The top of the skull extended backward from the great hooked mandibles, expanded like a shield over the neck where it was bordered by six powerful horns projecting from its posterior margin.

Among the important papers which he prepared in recent years were those describing the Triassic fishes of the Rocky Mountains. We are also indebted to him for important contributions to our knowledge of the Devonian fishes of New Brunswick. But it is with the wonderfully rich and varied vertebrate fauna of the Red Deer River valley of Alberta collected by the Sternbergs that Lambe was chiefly occupied in recent years. His various papers dealing with the Cretaceous faunas of the west show admirable illustrations of many of these bizarre creatures of the Canadian Cretaceous. Several new genera were described from the Alberta material.

A complete list of the papers of Lawrence Lambe will be published in an early number of the Bulletin of the Geological Society of America.

Mr. Lambe was elected a Fellow of the Royal Society of Canada in 1901, and was a member of various other scientific societies.

Lawrence Lambe belonged to that small group of men who find in their work their greatest pleasure. Palaeontological work was to him indeed a labour of love. The little worries of life seemed never to penetrate his optimistic temperament. His friends will long remember the cheery smile and kindly word with which he always greeted them. Lambe accomplished much toward revealing Canada's early vertebrate life, and wherever such knowledge is cherished his passing will be deeply regretted.

E. M. KINDLE.

WALTER R. BILLINGS.

Through the death of Walter R. Billings, Canada has lost a citizen of unusual attainments. His death occurred on March 1st, in his 71st year at his home in Ottawa. Mr. Billings was an architect by profession and a palaeontologist by natural taste and inclination. Although palaeontology was an avocation with Mr. Billings which he actively followed during only a portion of his mature life, the work which he has left forms a substantial and valuable contribution to the science.

The ancestry of Walter R. Billings on the paternal side was rather complex including Welsh, English, Scotch and Irish elements. The family seemed to have, as tersely stated by Chas. Billings, "nearly the whole British Empire" at their backs. The grandfather of Walter R. Billings was born in Massachusetts; the grandmother in New York. Braddish Billings, grandfather of Walter, was the first white settler in Ottawa. The grandparents of Walter came to Ottawa when there was nothing to suggest the future city of Ottawa which developed later over a part of the 1000 acre tract of land which they acquired. The mother of Walter Billings was a daughter of Capt. Walter Ross. Walter R. Billings was a nephew of Elkanah Billings the distinguished first palaeontologist of the Canadian Geological Survey. To palaeontologists the death of the nephew will recall the birthday of paleontological science in Canada, which may be said to coincide with the publication of Elkanah Billings' first paper on the Cystidea. To this able and remarkable man Canadian naturalists owe a debt of gratitude for starting at his own expense the first magazine devoted to natural history published in Canada. The eloquent declaration of E. Billings in a letter to Sir Wm. Logan at the time of sending him the first copy of the Canadian Naturalist and Geologist, is worth recording here as evidence of the fine courage and enthusiasm which dominated the father of Canadian palaeontology. To Sir William he wrote, "I have abandoned my profession, (journalism) and intend to devote the rest of my life to the study of natural history." One purpose of the new magazine he stated in this letter was to arouse "if possible the youth of this country to pursuits for which they have everywhere most unrivalled facilities."

With such a sponsor in E. Billings it is small wonder that palaeontology made a strong appeal to the subject of this sketch. Inspired no doubt by the work of his uncle, Walter R. Billings became an ardent collector of fossils. That his collections came to include many rare and beautifully preserved specimens is sufficiently attested by the published references of foreign palaeontologists to them. Dr. Bather of the British Museum has referred in various papers to specimens collected by W. R. Billings. The generous spirit of Billings led him to loan his collections freely to those prepared to make use of them and some of his rarest specimens were presented to the British Museum.

His own published studies were confined chiefly to the Crinoidea. He is known to students of the Crinoidea for his valuable work on the Trenton crinoidal fauna of Ontario. Walter R. Billings during the period from 1881 to 1887 described in the Transactions of the Ottawa Field-Naturalists' Club, several new species and one new genus from Ottawa and Belleville.

During this period Billings took an active part in the excursions of the Ottawa Field-Naturalists' Club sharing the leadership of field parties with such naturalists as James Fletcher, J. F. Whiteaves, W. R. Ells and H. M. Ami.

Many important additions to the knowledge of the Crinoidea have been mdae by Dr. Bather from studies of material collected by W. R. Billings. The very valuable collection of fossils left by Mr. Billings has been presented to the Canadian Geological Survey by his sister, Miss Myra, in accordance with his wishes. Besides the crinoids described by Billings, it includes much valuable material from other groups of fossils and many specimens from other countries.

Billings was always ready to place at the dispcsal of visiting geologists his intimate knowledge of collecting localities in the Ottawa district. Many geologists have been indebted to him for guidance to the interesting localities for collecting near Ottawa.

Palaeontology was as already stated an avocation with Walter R. Billings. He represented a type of man far too rare in Canada but more common in England, who finds the time and shows the ability to make worthy contributions to pure science while following a profession in no way allied to the science in which he delves.

Walter Billings was a man of broad interests and for many years took a keen interest in athletics. In his younger days he took an active part in the water sports for which Ottawa is noted. Many of his vacations were spent on his luxuriously furnished house boat.

The palaenotological studies of Walter R. Billings had enabled him to "peer far back into the night of time" but he claimed no such insight into the future as the great majority of men believe they have. His keen analytical mind had given him little if any knowledge of the uncharted seas of the Great Beyond. He was too frank and honest a man to lay claim to knowledge or beliefs which he had never acquired. It was therefore in deference to his modest views regarding the limitations of the human mind that the ceremonies usually observed, were omitted at the passing of Walter R. Billings. In his request that his remains be cremated we glimpse the fact that his concern was more for the welfare of those he left behind than for himself.

E. M. KINDLE.

BOOK NOTICES AND REVIEWS.

The library of McGill University has been enriched by a collection of text books, monographs, and sets of periodicals (in English, French, Italian and German) devoted to birds; constituting the Emma Shearer Wood Library of Ornithology. This library, the gift of Colonel Casey A. Wood of Chicago, to his Alma Mater, will be endowed by the donor, and is intended to serve not only as a reference collection for the use of college students and research workers but it will be available, so far as its more popular books are concerned, to readers, interested in birds, outside the University precincts.

It may be added that Dr. Casey Wood is an old Ottawa boy, having graduated as prizeman from the Collegiate Institute about 1875. He visited the Capital in 1918 as representative of the Surveyor General of the U. S. Army on a tour of inspection of our hospitals and other institutions engaged in the rehabilitation of our disabled soldiers. Col. Wood has retired from practice and is now engaged, in California, on the Medical and Surgical (American) History of the War and other literary tasks. He was the Secretary of the Committee that published the Anniversary Volumes dedicated to the late Sir William Osler.

In 1917, just before Dr. Wood took up his military duties he published his Fundus Oculi of Birds. This is an important study of a neglected subject. It is profusely illustrated with a wealth of coloured plates and line drawings and is a most valuable addition to avian anatomy in general and bird optics in particular. It also offers suggestions that may be of great value in the classification of birds.

NOTES ON SOME OF THE MORE COMMON ANIMALS AND BIRDS OF THE CANADIAN ROCKIES. By William Spreadborough. *Canadian Alpine Journal*, Vol. X., 1919, pp. 51-68. Mr. Spreadborough, the veteran naturalist and field collector, who has spent nearly every summer for the past thirty years with field parties of the Geological Survey of Canada, accompanying Mr. James McEvoy, Professor John Macoun, and the late Mr. James M. Macoun,

relates some of his interesting field experiences. Of mammals, he gives notes on grizzly bear, hoary marmot, Columbian ground squirrel, little chief hare, bushy-tailed woodrat or pack-rat, mountain flying squirrel, and Hudson Bay red squirrel.

Of birds, he gives many interesting notes on the habits of Richardson's grouse, grey ruffed grouse, Franklin's grouse or fool-hen, white-tailed ptarmigan, and golden eagle. Though he has written little, Mr. Spreadborough has a keen eye and ear for natural history work, and his wide journeyings into some of the most inaccessible parts of Canada have given him a wide knowledge of the habits of beasts and birds. It is to be hoped that he will put more of his observations on record.

R. M. ANDERSON.

MIGRATIONS OF THE GRAY SQUIRREL *(Sciurus carolinensis)*. By Ernest Thompson Seton, Journal of Mammalogy, Vol. I., No. 2, February, 1920, pp. 53-58. Mr. Seton quotes from early accounts of "incredible" migrations before the eastern wooded area was thickly settled. Robert Kennicott records a migration from Canada across the Niagara River into western New York. As corroboration of the high figures given by the old naturalists, from which may be deduced a gray squirrel population of several billions at one time in the area inhabited by the species in 1800, Mr. Seton states that recently it was necessary to thin out the gray squirrels in the protected area of Central Park, New York, and 300 were shot without making much perceptible difference. That is, there were over 1000 to the 300 acres of timber. "Im my recollection of a squirrel woods in Ontario, 1887, the numbers in Central Park are not to be compared to those in the northern woods. They were at least three times as numerous in the latter and yet we knew that there were about three to the acre in the park."

Mr. Seton asks young naturalists to render service now by interviewing all available old-timers who hunted squirrels in the 60's, and make a record of the time, place, extent, direction, etc., of every emigration that can be traced, together with facts that bear upon the causes and results or that in any way offer interesting light.

R. M. ANDERSON.

The Condor, Vol. XXI., ending Dec., 1919. During the past year there has appeared in this publication the following papers and articles of interest to Canadian readers:

P. 42, Sapsuckers and Hummingbirds, a short note by H. H. Mitchell, Provincial Museum, Regina, Sask. In this is described the visits of at least seven Ruby-throated Hummingbirds that successively came to drink sap flowing from the drilling made by a Yellow-bellied Sapsucker in a birch tree.

Pp. 57-60. Notes on the Breeding Habits of the Red Crossbill in the Okanagan Valley, British Columbia, by J. A. Munro, Okanagan Landing, B.C. This is an interesting paper on a little known subject. The author states that he secured specimens "which plainly show reversion from the yellow plumage to the red," thus giving evidence supporting the much disputed view that the red plumage is not the livery of the most mature birds.

Pp. 80-86. The Summer Birds of Hazelton, British Columbia, by P. A. Taverner, Geological Survey, Ottawa. This is an annotated list of 69 species noted or collected, in the summer of 1917, at Hazelton, on the Grand Trunk Pacific at its most northern point in British Columbia, by Wm. Spreadborough and the author.

Pp. 91-92. Letter by Mr. A. B. Howell, continuing the discussion started by Mr. Taverner's use of binomials.

P. 124. Mr. J. H. Fleming, of Toronto, has a note giving measurements and descriptions of Trumpeter Swans from California, the St. Clair Flats, Mich., and the State of Washington. Mainly details of a specimen in the British Museum, supplementary to its citation in The Game Birds of California.

Pp. 175. Editorial notice of the departure—May 14th, of a zoological collecting expedition from the Muzeum of Vertebrate Zoology, University of California, into Alaska and British Columbia, entering in the vicinity of Wrangell to proceed up the Stikine River to the neighborhood of Telegraph Creek. The party was composed of Mr. Harry S. Swarth, Curator of Birds in the museum and Mr. Joseph Dixon, Economic Mammalogist, and local assistants. It may here be noted that they returned in October with a large collection of important material. The expedition and the report that is planned to be published on its results was made possible through the financial interest of Miss Annie Alexander who has done so much to further zoological investigation on the Alaskan and British Columbian coast. It is well recognized in California, more perhaps, than anywhere else in this country that it is impossible to truly understand local zoological problems without studying adjacent extralimital territory.

Pp. 222-225. Bird Notes from Saskatchewan, by Mr. H. H. Mitchell, with three photographic illustrations. This consists of annotations on several species of birds. Brewer's Sparrow was found in some numbers in the valley of the Frenchman river, taken June 16, 1919, and fairly common between Eastend and Ravenscrag. Specimens identi-

fied by J. H. Fleming. The White-crowned Sparrow, the eastern form, breeding June 18, 1919, near Eastend. It has been previously been reported from the Cypress Hills by A. C. Bent and Wm. Spreadborough apparently breeding but without definite substantiation. The Chipping Sparrow is reported as breeding in the Cypress Hills but is declared to be "not common in any part of the province." The breeding form of the Horned Lark in the Cypress Hills is declared to be the Desert Horned Lark, *Otocoris alpestris leucolaema*. It is not evident from the context whether Mr. Mitchell regards Mr. Oberholser's *Enthemia* as a separable race which would be the expected form if it is. The Whip-poor-will was heard near the juncture of the North and South Saskatchewan rivers, about thirty miles east of Prince Albert, on July 15, 1919. This forms the first record for the province and the farthest west for Canada. Whether there is any likelihood that one familiar with the call of the Whip-poor-will of the East could mistake that of the Poor-will, can best be judged by those who are acquainted with both. Either species would be important.

P. 239. An amusing reason for the elimination of the subspecies is reported by J. H. Fleming from the suggestion of the editors of the London Catalogue of British Plants, third edition, who oppose plant splitting on the grounds that it would make the catalogue unduly bulky and raise the postage on it beyond the limits of a blue (two penny) stamp.

P. 240. In a short note we are informed that Mr. Geo. Willet has established himself on Prince of Wales Island, Alaska, for the winter and expects to devote practically his entire time to ornithology. Prince of Wales Island is on the Pacific Coast just across Dixon Channel from the Queen Charlotte Islands and hence so close to British Columbian waters as to be of great interest to Canadian ornithologists. Information of this coast is not very complete and there is probably no place on the continent where a winter's work could be put in to better scientific advantage.

P. A. TAVERNER.

NOTES AND OBSERVATIONS.

A CANADIAN NATIONAL MUSEUM.—The following is a copy of a resolution passed by the Council of The Ottawa Field-Naturalists' Club, on March 12, 1920.

"Whereas all important civilized nations have found it desirable and necessary to establish national museums as storehouses and repositories for historic artistic and scientific treasures, safe from the ravages of time or accident, or the exploitation or caprice of private ownership, and where they will be available for the study or contemplation of the whole nation rather than of the favored few, and

"Whereas Canada has at this time no such national museum definitely established as such,—

"Be it resolved that the Council of The Ottawa Field-Naturalists' Club recommends that for the purpose of the safe-keeping of specimens of national importance, as an aid to and encouragement of Canadian scientists, to act as a general clearing house of scientific endeavors, for the general education of the public and as a monument to Canada's intellectual life, the present museum organizations under the Federal Government of Canada be re-established as a Canadian National Museum. And, further, that the Council urge upon Parliament that steps be immediately taken to establish such a museum as will worthily and creditably represent the Dominion amongst like institutions of the world. And further, that a copy of this resolution be given to the press, and also published in *The Canadian Field-Naturalist*."

"PRAIRIE" FRINGED ORCHID. Mr. F. Morris, 643 Aylmer St., Peterboro, would be glad to hear from any reader of the NATURALIST who knows of a station in Ontario for the so-called "Prairie" Fringed Orchid *(Habenaria leucophaea)*. It was found by him on the margin of a mud lake near Smith's Falls some 20 years ago, and in the moist heart of a tamarac swamp near Port Hope, 10 years ago, growing in Sphagnum moss with pogonias and cranberry vines close to standing water and cattails. It is a tall handsome plant with large creamy white flowers having a three-parted lip of fanlike and fringed divisions and a very long curving spur; the plants stand from 2 to 3½ feet high."

THE PROVINCE OF QUEBEC SOCIETY FOR THE PROTECTION OF BIRDS, MONTREAL, recently held meetings as follows:—

Jan. 12. Annual Meeting—Report—Election of Officers. Address: Mr. Napier Smith.

Feb. 9. The Traditions and Superstitions of Birds and Insects. Speakers, Miss M. Hadrill and Mr. A. F. Winn.

G. M. Dyer, Hon. Corres. Secy.

THE CANADIAN FIELD-NATURALIST

VOL. XXXIV. APRIL, 1920. No. 4.

NOTES ON THE MAMMALS OF RIDOUT, DISTRICT OF SUDBURY, ONTARIO.

By J. Dewey Soper.

The comparative isolation of much of Northern Ontario from centres of habitation, seems a reasonable cause for the relative dearth of literature on the mammals from this region. The smaller species have, naturally, received little attention, and much is yet to be known about them, notably in regard to their range and life histories. Big game hunting and the fur-trade have doubtless conduced to a greater familiarity with the larger mammals than would otherwise have been the case. So far as is known the Ridout country has had no detailed investigation of its animal life; because of this fact the present paper based upon a collection of 55 mammals and observations thereon made in the immediate vicinity of Ridout is presented.

The first visit to the locality was from October 20 to November 2, 1917, efforts being mainly directed to the accumulation of notes on the larger mammals and birds of that period. With the present paper in view a return was made the following year, from October 1 to November 1, with every provision for the collection of specimens in order to round out the data as fully as possible.

The Jumping Mice *(Zapus hudsonicus* and *insignis)* were not secured, due partly to their early habit of hibernation. No bats were observed, nor Flying Squirrels *(Sciuropterus sabrinus)*. No signs were seen of the Star-nosed Mole *(Condylura cristata)*. Various circumstances prevent the list from being complete.

Ridout is situated on the Canadian Pacific Railway, 132 miles north-west of Sudbury, 166 miles south-east of White River, 96 miles north of Lake Huron and 280 miles south-west of James Bay. It is located upon the northern height of land at an elevation of 1,364 feet above the sea and 778 feeet above Lake Superior. The surrounding hills range in altitude from 1,400 feet to probably 2,000 feet. Magnetic variation is about six degrees west of astronomical north.

The whole region is intersected by hundreds of streams and dotted with countless lakes of all sizes. Many feeders of that noble stream, the Moose River, find their source along the height of land, converging fan-like to the majestic tide that sweeps northward to James Bay. Others, notably the Spanish River, flow southward to the Great Lakes.

The general character of the country about Ridout is that of vast rolling forested hills with frequent outcrops of gneiss or perhaps schist and greenstone. Some distance to the east, however, the region is broken into gigantic rock masses, mountains, and escarpments of desolate and infinite grandeur. The whole lies to-day as through all the ages.

Ridout lies well within the Canadian zone and in floral aspect resembles broadly that of all timbered sections west of Sudbury. Occasional boreal "islands" suggest the stunted evergreen forests of the Hudsonian zone. Conifers are everywhere predominant, the greater portion of the woods consisting of White and Black Spruce *(Picea canadensis* and *mariana)*, Balsam Fir, *(Abies balsamea)* and Banksian or Jack Pine, *(Pinus banksiana)*. Yellow and Canoe or White Birch *(Betula lutea* and *papyrifera)* occur, the latter especially being common and growing frequently in pure stands upon the side-hills. White and Red Pine *(Pinus strobus* and *resinosa)* flourish in varying numbers. The remaining common trees of the forest are Hemlock *(Tsuga canadensis)*, Tamarack *(Larix laricina)*, White Cedar *(Tsuga occidentalis)*, Aspen Poplar *(Populus tremuloides)*, Balsam Poplar *(Populus balsamifera)* occurring on low ground along lakes and streams, Alder *(Alnus incana)* and the Mountain Maple *(Acer spicatum)*. *Salix rostrata* is the only tree-like willow. Blueberries are usually an abundant crop, and numerous flowers, particularly the wild rose, I understand, grow in great profusion during the northern summer. Mosses and lichens occur almost everywhere on rocks, logs, ground and upon the branches of standing trees.

The avifauna of the region for October while inextensive will convey certain impressions in a brief list, impossible to other things. Birds noted

during the first week of the month were Robin *(Planesticus m. migratorius)*, Crow *(Corvus brachyrhynchus)*; Raven *(Corvus corax principalis)*; Canada Jay *(Perisoreus canadensis)*; Blue Jay *(Cyanocitta cristata)*; White-throated Sparrow *(Zonotrichia albicollis)*; Great Blue Heron *(Ardea herodias)*; Black-capped Chicadee *(Penthestes atricapillus)*; Slate-colored Junco *(Junco hyemalis)*; Horned Lark *(Otocoris alpestris)* and Rusty Blackbird *(Euphagus carolinus)*. On October 10, a Kingfisher *(Ceryle alcyon)* and Pileated Woodpecker *(Ceophloeus pileatus abieticola)* were observed, the latter again on the 21st. One Tree Sparrow *(Spizella monticola)* was noted on the morning of October 13. During the afternoon of the 18th, Pine Grosbeaks *(Pinicola enucleator leucura)* were common. The first small flock of Snow Buntings *(Passerina nivalis)* made their appearance the following day. A single Arctic Three-toed Woodpecker *(Picoides arcticus)* was observed on Oct. 21. Ruffed Grouse *(Bonasa umbellus)* was noted but not commonly.

In the preparation of this article I have received many courtesies from Mr. W. E. Saunders, of London, Ont., and Dr. R. M. Anderson of the Geological Survey, Ottawa. The late Mr. James M. Macoun also of the Geological Survey, kindly furnished the proper common and scientific names of the trees known to occur in the region. To Mr. George Visser, of Ridout, I am indebted for many favors extended during the trip.

COMMON EASTERN SHREW, COOPER SHREW, OR MASKED SHREW, *Sorex personatus personatus* I. Geoffroy.

The masked shrew is very common at Ridout, persisting in nearly all situations from low woods and meadows to the wooded ridges.

Nine specimens were taken. Color.—Dorsal surface of the body brownish-gray, the latter barely perceptible; brown deeper on the rump. Sides slightly lighter. Belly, throat and chin ashy-gray, no sharp line of demarkation between color of belly and sides but change taking place rather abruptly. Tail obscurely bicolor, brownish above, paler below. Feet very light brown.

RICHARDSON'S SHREW, *Sorex richardsonii* Bachman.

Only three specimens of this beautiful shrew were collected at Ridout. A fourth was found dead on a trail through the woods but was beyond the stage for proper preservation. One of the three preserved was found lying dead on a trail intersecting a low meadow. No marks of violence were found on either of these animals but probably the pounce of a cat or bird would be sufficient to extinguish life, the aggressor leaving it unmutilated when discovering by the unsavory odor of its prey (which characterizes the shrews) the reality of its mistake. Few animals, I believe, devour the shrews on this account, and I have seen dogs that were very reluctant to even kill them for the same reason.

One man whom I talked with in the north firmly believed that every Richardson's shrew that crossed a human trail fell dead instantly; the idea doubtless originating from the appearance of numerous shrews in these places. The two which I found in the traps were in low damp meadows frequented by the Forest Vole *(M. fontigenus)* and the Mole Shrew *(B. brevicauda)*. So far as I am aware these specimens represent the second record for Ontario, the other being Miller's two specimens collected at Peninsula Harbor, in 1896.

SMOKY SHREW, *Sorex fumeus* Miller.

Only one specimen of this comparatively rare shrew was collected at Ridout. Its identity among many of the common shrews was for a time uncertain but it has now been referred to this species by both Mr. W. E. Saunders and Dr. R. M. Anderson. It was collected on Oct. 12, 1918 and measured: Length, 108 mm.; tail vertebratae, 44 mm.; hind foot, 15 mm.

Colour:—Bicolor; back, dark brownish; underparts slightly paler rust brownish. Pelage slightly glossy.

MARSH SHREW, WATER SHREW, *Nesorex albibarbis* (Cope).

At Ridout I found that the water shrew was uncommon. Three specimens collected may be described as follows: Color—Above very dark, in some lights almost black, in others, faint brownish-black or greyish-black, overlaid almost imperceptibly with silvery tip to some hairs giving it a slight frosted appearance. Belly silvery-grey washed with dusky, heaviest between forelegs. Whitish around lips and chin. Tail bicolored, blackish above and around the tip, white below. Feet, light brown and fringed with silvery, bristle-like hairs, adapted for swimming. All are apparently adult and in winter pelage.

It is perhaps strange that I found the water shrew in only one very limited locality at Ridout. This was along a small brook which flowed down from the timbered hills and entered the Ridout river a short distance east of the station. At intervals its margin was grassy and moss-grown and underneath this by lifting away the growth, the tiny tunnels of the shrew could be seen. In a space about twenty-five yards in length along the western bank of this streamlet I trapped the three specimens mentioned, all in four days, from Oct. 4 to 7, after which no more were taken. Beyond doubt extended diligence would locate other small

families or colonies along other brooks, beside the river or about beaver meadows. The other small mammals taken in the traps set for *N. albibarbis* were *Blarina brevicauda*, *Sorex personatus*, and if I remember rightly the only specimen of *Sorex fumeus* which I collected on the trip.

SHORT-TAILED SHREW, BOB-TAILED OR MOLE SHREW, *Blarina brevicauda* Say.

The eastern shrew is very common at Ridout.

The seven specimens collected average larger than those given by Merriam from type locality* (near Blair, Neb.) and considerably larger than his eastern specimens from Martha's Vineyard, Mass.

The Ridout specimens are also larger than the average of nine specimens taken from my collection at Preston, Ontario.

As is usual within its range, this shrew was found at Ridout in nearly all situations, from low, mossy swamps to wooded ridges. Scarcely a trap in any of these places but sooner or later yielded a *Blarina*. It was uncommonly abundant in low grassy meadows adjacent to dank spruce woods. By pressing the vegetation aside in these places I discovered small feeding pockets beneath, arched over thickly with grass, the bottoms, being covered with varying depths of excrement. Examining these places, the first day at Ridout, I credited the sole ownership to the Forest Vole *(M. fontigenus)* but soon discovered my mistake, for from six traps set in a grassy depression not over fifty feet in diameter, the following morning I took three blarinas and only one *Microtus*. Favoring *Blarina*, the ratio as a whole was even greater than this; in fact it is the mos abundant species of mammal in the region and perhaps anywhere in Eastern North America.

Occasionally I found specimens in traps set for *Evotomys* and *Synaptomys* under logs in the deep moss of spruce woods; other times in hill-side sets among the pines intended for *Peromyscus* and just as often in the subterranean tunnels of *albibarbis* along the streams. The grassy sink-holes or meadows dotted with low bushes and shrubs, appear, however, to constitute the over-flowing nucleus from which, radiating, they invade every conceivable surface situation.

BLACK BEAR, *Ursus americanus* Pallas.

The black bear is reported as being tolerably common throughout the region. Although numerous signs both recent and old were observed, no individuals were encountered. The black bear usually eludes the hunter very cleverly, offering comparatively few shots, but large numbers are taken in heavy steel traps every spring. The following brief "experience" was told to us by a trapper on Oct. 30. in search of good trapping grounds, he came suddenly upon a big black bear feeding, partly concealed behind a low windfall. The trapper carried no fire-arms, only a light axe and a hunting-knife, but was determined not only to discover what the bear was feasting upon but also if chances offered to kill it with the axe. But contrary to the usual custom, bruin preserved a stern front and refused to quit the scene. Several experimental advances on the trapper's part ended with negligible results and the conviction that discretion was here the better part of valor. Several times old bruin waddled a few paces away, but would immediately return with wicked eye, watchful and sullen. After some manoeuvering however the trapper detected the protruding blade of a moose's antler but further critical scrutiny was suspended as impracticable.

The interesting point lies in the fact that a few days previously a bull moose was wounded near the Ridout river five miles to the east, and when last seen was running in a westerly direction. We suppose that the dead moose and the wounded one are identical and before succumbing to injuries had traversed the considerable intervening distance.

GRAY WOLF, *Canis occidentalis* (Richardson).

Wolves are reported as occuring throughout the timbered portions of Algoma and Sudbury, but never numerous. None of recent occurence at Ridout. Inferring from many wild wolf stories afloat, the tribe seems numerous enough north of Superior and surrounding Lake-of-the-Woods.

COMMON RED FOX, *Vulpes fulva* Desmarest.

The red fox occurs in fair numbers at Ridout judging by reports and the numerous tracks observed in the snow about the wooded hills and over the open ridges. All the freak color phases, black, silver and cross are represented in the pelt collections taken from the country.

MARTEN OR AMERICAN SABLE, *Martes americana* (Turton).

No sign of the marten was seen at Ridout, although I traversed several tracts of very likely looking country. My friend Mr. Visser informed me that three skins were procured by him from Indians coming in from the south, apparently from the region of Wakami, Pike, Trout and Kebskashishi Lakes. It is quite likely that all the old forests in Algoma not visited by fire are inhabited by marten in varying numbers. While on a canoe trip north of the confluence of the Ridout and Walkam rivers in Oct., 1917, I saw what looked like good marten country but had no time to investigate. This was high, heavily-timbered country about a fair sized lake. On the Standard Top. Map (Cartier Sheet) this body of water bears no name.

While exploring some heavily timbered country

* N. A. Fauna. No. 10, p. 11, 1895.

Miller* remarks: "At Nipigon a trapper told me that martens, wherever they occur in sufficient numbers, so terrorize the red squirrels by constant persecution that the noisy rodents, learning that silence is their best protection, stop chattering. Hence an abundance of silent squirrels is—according to my informant at least—a certain indication that marten fur is plenty. According to this, there are no martens at all near Ridout.

FISHER, *Martes pennanti* Erxleben.

Consensus of opinion admits this animal as commonly occuring in all the wooded country. An ex-forest-ranger with whom I talked said that while existing in fair numbers, they never became abundant, according to his observations. On Oct. 18, I took one in a bear trap set at the offal of a moose, near the Ridout river. This was several miles north of the railway and in a comparatively heavy belt of spruce timber. The specimen was a well matured male and according to numerous published measurements exceeded the usual size. Total length, 36½ inches; tail, 14½ inches; foot, 5 inches. The ground color over all was a brown of medium depth very liberally besprinkled dorsally with hoary greyish-golden guard hair; the posterior portion more suggestive of gray.

The fisher is regarded as one of the few successful enemies of the porcupine from the frequency of "porky" javelins somewhere in its anatomy, which as a rule produce no bad effects. Although my specimen was apparently an old adult, no evidence of this was to be seen. Probably the general scarcity of *Erethizon* would account for it.

SHORT-TAILED WEASEL, *Mustela cigognanii* Bonaparte.

Numerous tracks of weasels were noted especially during the autumn of 1917. No specimens were secured, but the trails and a single medium sized weasel hastily observed near the station were referred to this species.

MINK, *Mustela vison* Schreber.

The mink is fairly common at Ridout. The lavish distribution of streamlets, rivers and lakes throughout the region should prove a very congenial home for it. After a light fall of snow in November, 1917, I saw signs of one along the border of a small brook. A trainman saw one running along the Ridout river on October 25, 1918.

CANADA SKUNK, *Mephitis mephitis* Schreber.

Skunks are found in varying numbers throughout the region, but their distribution is governed locally by favorable situations. Much of the country is clothed heavily with conifers, and where this exists with low, damp, mossy ground the skunk could scarcely be looked for. The poplar covered ridges with warm southern slopes form a congenial habitat for the species and many occur in the region. In a sandy slope covered with low deciduous trees north of Ridout I found two dens which I think belonged to this species; both had every indication of recent occupation. Mr. Visser has observed the animal on but two or three occasions at Ridout but informs me that its occurrence is more frequent about the higher ground at Lake Pishkniogama a short distance west of Ridout. The first week in November, 1917, we saw one cross the rails near the station and disappear in the woods.

CANADA OTTER, *Lutra canadensis* (Schreber).

Mr. Visser informs me that although the region yields a number of skins each year, the species is not very common. Where, as at Ridout, the nature of the rivers are such that no alluviul material is deposited along their courses, evidence is scant in determining the occurence of terraqueous species such as the other. Personally I observed no signs.

After ice forms, and there is a surface of light snow, the long excursions of the otter marked by its conspicuous trails are commonly seen. They delight at this time in the fair open expanses of river and lake and enter into long nocturnal journeys. Once, on ascending the Hay river in Alberta, a fresh otter trail of the night before preceded me all day and was still in evidence when I camped for the night, headed strong into the mountains. The distance traversed by this animal before and after my own day's journey of about fifteen miles, and added to it would, if known afford a very interesting and perhaps surprising figure.

The usual mode of travel at such times is the alternate jump, and slide, peculiar to the species, with the latter five or six feet in length and maintained in untiring regularity by the momentum received from each quasi-double bound. Each river riffle on these journeys are unfailingly explored, with varying success. If compensated the evidence is plain enough—a few flecks of blood, probably a fin, or a number of scales, and a yellowish stain in the water-soaked snow at the lip of the ice-hole. A corpulent male shot in November while feeding on a wild duck at one of these holes, was rankly "fishy" and loaded with fat.

CANADA LYNX, *Lynx canadensis* Kerr.

According to all accounts the lynx is at present the commonest furbearer in Algoma, and the Indian's specialty. The recent annual "catch" I understand has been large but the diminution of hares may soon cause a change of local fortune in lynx skins. Lynx snares of former date were frequently noted along the Ridout and Wakami rivers,

*Miller, Jr., G. S., Mammals of Ontario, Vol. 28, No. 1, p. 42, 1896.

indicating the animal's habit of travelling in such places. Winter or summer they seem to have a regular route, usually at the forest's fringe; about rivers, lakes, or natural meadows rather than in the extreme depths. In western Alberta I learned that the Indians know these routes so well that snares at peculiarly favorable places are maintained in season, from year to year and are handed down as a heritage from father to son. The general topography of a region usually suggests to the experienced man, the favorable disposition of snares. Lynxes do not confine themselves to the lowlands for they possess an inherent love of expanse that betakes them regularly to breezy heights or the lip of yawning space.

One day, in November, I happened upon a young Indian preparing a snare for lynx on a semi-forested elevation hundreds of feet above the Hay river. Expressing surprise at the choice of such a place for a snare the young Cree answered in broken English "Him good; much go." I took his word for it. Passing by a few days later while moose hunting, sure enough a big cat was there, choked to death and apparently by his own effort, for both front feet were stiffly braced against the toggle to which the snare-thong was tied.

It is perhaps interesting to note that the inevitable "beaver castor" so alluring to many animals, is equally so to the big cat. He simply cannot resist it. To purr and rub his neck against the concoction is apparently the one unsatisfied ambition,—unsatisfied because the snare acts first. An Indian that I entertained in my cabin one night loosened up enough to tell me that the Crees' common brown "lynx dope" was simply a mixture of boiled rabbit liver and beaver castor. As beaver were protected in Alberta at that time, we are permitted to guess where they got the "castor."

DUSKY WHITE-FOOTED MOUSE, *Peromyscus maniculatus maniculatus* (Wagner).

The white-footed mouse is fairly common at Ridout, having collected it in nearly all high situations both semi-barren and timbered.

By measurements (actual and relative) nine specimens taken come well within the limits of *P. m. maniculatus* (Wagner)=*Peromyscus canadensis umbrinus* Miller, recorded from Peninsula Harbor, Ont. (Notes on the Mammals of Ontario).

"These specimens do not seem to show any intermediate characters in measurements or coloration with *P. maniculatus gracilis* (Le Conte) =*P. canadensis canadensis* Miller." R. M. Anderson.

All but one have tails slightly less than half the total length. All have under-sides of hind-feet haired except on the pads and spaces between—length 20 mm. or greater.

This northern variety of the white-foot, was found in nearly all of the greatly diversified surface situations. Include *Blarina* and the two cover the territory very well. On the very edge of low mossy woods I have taken them in traps set for *Evotomys* (Red-backed Vole) and likewise in "sets" made on high ground intended for other mammals. One afternoon while crossing a small barren plateau I noticed a neat little hole driven deep into the soil beside a log. Miller's incident with *Phenacomys* was immediately recalled, wherefore through a little inductive reasoning I expected next morning to catalogue one of those voles, but alas, the trap held only a lonely *Peromyscus*. That was the closest I got to *Phenacomys*—in all probability rather remote.

The places of commonest occurence for *Peromyscus*, were about the fringe of woods bordering natural meadows or rocky tree-interspersed land. While trapping for Hoy's shrew *(Microsorex hoyi)* on dry wooded hill-sides, though failing to get that animal, I never wanted for deer mice. North of the station a small glaciated and striated ridge of granite ran east and west, covered with conifers wherever enough till or mould had accumulated in its hollows to support them. On the south side several small wooded terraces sloped down, alternating with rock which often formed low precipitous backgrounds for the former. At the foot of these among the trees I set a number of traps because in the individual character of the situations they seemed to offer good opportunities for intercepting any small mammal that ran the ledge. But, again, though taking a number of the Masked Shrew *(S. personatus)*, *Peromyscus* inevitably paid the greater price. And incidentally, this was one place that I failed to get *Blarina*—a genuine relief. Twice I trapped the dusky mouse in low grassy creek borders but the dainty white-foot usually haunted higher ground.

NORTHERN LEMMING MOUSE, *Synaptomys fatuus* (Bangs).

This lemming is uncommon at Ridout. Only two specimens were collected. These are identical in appearance, except for the smaller size of No. 353 which is evidently juvenile or adolescent. They are similar to adult *Microtus p. fontigenus* but the pepper and salt effect on the back is noticeably coarser. These examples were taken in the same strip of swamp. Though persistent trapping in most favorable places was conducted for several weeks, no further specimens were observed. Only a few yards separated the two traps which captured them, both beside decayed, moss-covered logs in the sphagnum of a spruce woods north-east of the station.

The situation is only a couple of feet above the Ridout river's highest water mark. Their preference for cool, mossy, damp woods is clearly evident. No trails made by these animals or any other small mammal could be found; evidently all ranging indiscriminately over the forest floor. The other animals found associated with *Synaptomys* were *Evotomys gapperi*, *Sorex personatus*, and *Microtus p. fontigenus*.

RED BACKED MOUSE, *Euotomys gapperi gapperi* (Vigors).

Though experiencing no particular difficulty in collecting red-backed voles at Ridout, their numbers were evidently much less than were found by Miller north of Lake Superior.

The six specimens taken are all of the red phase. Two individuals are somewhat larger than the others. An examination of the teeth seems to indicate that all are young, with the exception of two which are noticeably inclined to the double-rooted molar of the adult. These were not, however, deep and distinct, better described perhaps as half-rooted.

This was found in two distinct surface situations, the deep mossy woods and the comparitively high ground adjoining them. The first specimen I trapped was on a low pine ridge with an elevation of about forty feet above the contiguous spruce woods. Another was captured in a similar situation but lower in elevation, sparsely wooded, and strewn with rocks. The remainder were taken in deep forests. Nowhere was the species common.

FOREST MEADOW MOUSE; FOREST VOLE; HUDSONIAN MEADOW MOUSE, *Microtus pennsylvanicus fontigenus* (Bangs).

The forest vole appears to be rather uncommon at Ridout; though traps well baited and in favorable places remained set throughout the full time of the trip, only four examples were secured. This seems to suggest a scarcity of the species at least locally. All were taken in natural grassy meadows in the vicinity of the Ridout river. Particulars of the habitat will be found under *Blarina brevicauda*.

I had hopes, after making dental and cranial examinations of these four specimens of finding a *Phenacomys* among them but in this I was disappointed. It is reasonable to suppose that a colony exists in the vicinity of Ridout since Miller took them at Peninsula Harbor and as their range extends east to Labrador.

The blackish-brown, and smaller size of two of the individuals indicate their immaturity. The two other examples, both adults are dull chestnut-brown above, darkened along the back with coarse black hairs. Underparts in one silvery-plumbeous, in the other plumbeous gray tinged with pale buff. All have feet brownish and tails indistinctly bicolored.

MUSKRAT, *Ondatra zibethica* Linn.

Mr. Visser informs me that formerly the muskrat was common in the region but exceptionally high water, I think a couple of years ago, nearly exterminated them. The extensive and elaborate water-system of the country should be very favorable for this animal. Only a couple were seen while canoeing on the Ridout river; while of the usual "sign" on partly submerged logs, little was in evidence. No houses were observed.

CANADA PORCUPINE, *Erethizon dorsatum* Linn.

The porcupine occurs sparingly throughout the region. Although spending several weeks during two autumns in the forests about Ridout only one individual was seen. This one was curled up and asleep under a big spruce in the midst of an extensive coniferous forest. Little trails running out in several directions from the cozy hibernal retreat, showed plainly in the deep moss as they lead up to numerous trees upon which the porcupine fed. The scarcity of the species in the locality may be a reflection of similar conditions throughout the county. Preble[1] found them nowhere abundant on his Hudson Bay trip and remarks: "In a country where the life of the native is a constant struggle for food, the ease with which this animal may be taken, is sufficient reason for its scarcity."

CANADA WOODCHUCK, *Marmota monax canadensis* Erxleben.

I could get no information concerning this animal at Ridout. The season was already too far advanced when I arrived for any collecting, as the animals hibernate in mid-September. Some small burrows observed on sandy southern slopes and credited to *Mephitis mephitis* may have belonged to *monax*.

Miller[2] reported the woodchuck common at Peninsula Harbor so they may be expected to occur at Ridout. Preble[3] also alludes to specimens recorded by Allen from James Bay and Nelson River.

LAKE SUPERIOR CHIPMUNK, *Eutamias quadrivittatus neglectus* (Allen).

This small form is only of moderate abundance at Ridout. Miller found it "excessively abundant" on the north shore of Lake Superior but these superlatives would not apply in this instance.

Regarding these specimens collected, Dr. R. M. Anderson remarks: "These specimens differ principally from *Eutamias quadrivittatus borealis* (Allen), Northern Chipmunk, in having the sides much redder; typical *borealis* having the sides pale

(1) Preble, E. A., Mammals of Keewatin; N.A. Fauna, No. 22, p. 59, 1902.

(2) Miller, Jr., G. S., Mam. of Ont., Vol. 28, No. 1, p. 26, 1896.

(3) Preble, E. A., Mam. of Keewatin, N.A. Fauna, No. 22.

yellowish-brown. Occasional specimens of *borealis* from Saskatchewan and Alberta approach these specimens in reddish tint of sides, but have the backs averaging much paler."

In a state of nature, the smaller size of this chipmunk combined with the relatively longer tail carried stiffly erect when travelling, serves readily as a means of differentiation from the larger species *striatus* which shares this same region. At a glance too, it appears much darker, perhaps because of the comparatively closer grouping of the dorsal stripes and the absence of chestnut or deep reddish-brown on the rump which characterizes the big chipmunk.

Neglectus lives not only on the hillsides among the open boulders but also frequents remote places in the tangled wilderness. Twice I found them on slight declivities far in the forest surrounded by a maze of fallen trees, boulders and brush and other things which vex the tired traveller. Thoughts of fatigue, however, disperse when a trim little chipmunk shrills at your elbow, and disappears like a buffy streak with twinkling feet curiously attached to a long tail. In a moment if all is quiet, he may reappear, but most likely scolds and protests from a deep retreat until you leave. One observed in mid-afternoon comfortably hunched in the October sun was discovered later to have been doing some "fall threshing," the grain, so called, having been removed from low shrubs among the boulders.

In favorable places along the railway I found this chipmunk much commoner. Many birds and a few mammals are attracted there by slight grain leakages from passing trains. One "little chipmunk" I could count on seeing nearly every fine day near a pile of boulders bordering the highway; scraps from a near-by boarding car furnishing his meals *de luxe* without further anxiety, and extending his available time for frolic. Sometimes when I wandered by and interrupted this sumptuous pastime he would scramble with great concern over the sloping ballast and leap into a truck beneath the car. Once there I never could discover him, although meanwhile I must have been under constant surveillance as manifested by his prompt return to *terra firma* the moment I was gone.

Neglectus enters traps readily and is successfully retained by almost the smallest sizes. Once I found one dead in a small Victor mouse-trap, (the smallest size) set for a shrew at the base of a mossy stump in a pine woods. This species is said to be hardier than the larger chipmunk, remaining above ground much later in the season. In this respect I found only a few days' difference but the forepart of the month (October) which was so favorable to *striatus* terminated in weather unsuited to either, so that the equalizing effect in favor of *striatus* terminated in weather unsuited to either, so that the equalizing effect in favor of *striatus* in this instance, diminished the difference between them. Miller, (Mammals of Ontario) found that on the north shore of Lake Superior the big chipmunk hibernated about the end of September. At Ridout, I last saw it on October 12; the two following days were cold and on the 15th it snowed, probably hastening its hibernation. So far as I am aware *neglectus* disappeared for good on October 14.

EASTERN CHIPMUNK, *Tamias striatus lysteri* (Richardson).

The Eastern Chipmunk occurs in about equal numbers with the smaller species *neglectus*. Apparently not nearly so numerous as was found by Miller at Peninsula Harbor and Nipigon. (subspecies *griseus*).

Dr. R. M. Anderson after examining three specimens collected at Ridout reported: "Our museum specimens of eastern chipmunk *(Tamias s. lysteri)* are not strictly comparable with these as to season, being early summer specimens, and averaging lighter in color. The Ridout specimens being in autumn or early winter pelage, show a markedly grayer cast; they also have a much deeper shade of brownish red on the rump than is found in our twenty-five specimens (from Gulf of St. Lawrence, Point Pelee, Lorne Park, Ottawa, and Algonquin Park, Ontario). The Ridout specimens, however, are similar in size to the eastern specimens and are very much smaller than our only specimen from farther west, *Tamias striatus griseus* Mearns, Gray Chipmunk, from Shoal Lake, Manitoba, and unlike the typical *griseus* do not have the dorsal stripes running back on the rump."

While in the Ridout specimens there are no marked separable characters from true *lysteri*, a slight approximation to *griseus* doubtless exists, since Miller's specimens (though typical *lysteri* from North Bay) approached *griseus* more closely than *lysteri* at Peninsula Harbor and Nipigon. Ridout is roughly mid-way between North Bay and the former point.

These large chipmunks inhabit the same general localities as *neglectus* but I believe are more favorably disposed to the deeper woods. Around Ridout, their choise was semi-wooded, boulder-strewn situations near the skirts of the forest and always on high ground. A place of this description, east of the station I visited on October 7. The forenoon was bright and warm and the chipmunk population everywhere in evidence, the calm forest resounding with their hollow *tuck-tuck-tuck* until careful restraint was necessary to prevent an undue impression of their numbers. They were there in conspicuous numbers, however, each "calling" his

best, evidently to emphasize the beauty of the morning.

NORTHERN RED SQUIRREL, *Sciurus hudsonicus hudsonicus* (Erxleben).

The red squirrel occurs in abundance throughout the region.

"The specimens submitted (three) seen to be typical *S. h. hudsonicus*, showing little difference from specimens from Algonquin Park, Kabatogama Lake (St. Louis Co., Minn., near the Inter. Boundary), and Edmonton. The Minnesota specimens approach to the range of *Sciurus hudsonicus minnesota* Allen, but are probably *hudsonicus*. Hollister (Bull. Wis. Nat. Hist. Soc.) places specimens from Two Harbors, north of Duluth, Minn., as *S. h. hudsonicus*." (R. M. Anderson).

The specimens reported upon by Dr. Anderson show a gradual advance from summer to winter pelage—discarding the dark brown of the back, ochraceous-white of the underparts and the black lateral stripe of summer, for the greyish ground color of the back, reddish dorsal band and neutral plumbeous-white of winter. Examination of the specimens seems to indicate a complete moult in about three weeks: Sept. 25-Oct. 14.

It will be interesting to note here in regard to the shedding of *Sciurus* that in one individual the summer coat was being shed uniformly from rear to front, the line of demarkation between the two conditions being plainly evident. In a specimen of *loquax* taken at Preston, Ont., May 13, the same uniformity of shedding prevailed only exactly reversed; the moult beginning at the head and advancing backward. The demarkation in this specimen is very pronounced. The process affecting the new coat seems to be confined chiefly to the active edge of the renewing area, where apparently the old hair drops out and the new replaces it in a gradual advance, each portion maintaining simultaneously the pure color of the respective seasonal pelages, with but little scattered shedding. This unusual manner of assuming a new pelage may be likened (permitting the simile) to an ice sheet, slowly enveloping a continent with the principal physical changes devolving from the active forces of its advancing border.

CANADIAN BEAVER, *Castor canadensis* Kuhl.

I found the beaver common on all the rivers and many of the lakes in the locality. Abundance of signs on the Wakami above its junction with the Ridout river and the absence of lodges indicates the "bank nest" as the permanent abode. Along the latter stream, where dams and lodges are common, the shores for the most part are low, sometimes marshy, and fringed with willows. The Wakami river on the other hand is bordered with comparatively high banks and heavily timbered. At present, the trapping of beaver in Algoma is restricted to ten animals each year, per trapper. Each skin must be accompanied by a government "beaver coupon" (each 50 cents) before sale or shipment. This should have a beneficent result toward their conservation.

HUDSON BAY VARYING HARE, *Lepus americanus* Erxleben.

The hare, as is commonly known has its septenary ebb and flow of abundance. At Ridout, conditions pointed to a low ebb; only a few signs, mostly old, were observed, and but one or two animals. A female taken on October 4, 1918, was beginning to change very slightly into the winter pelage over the buttocks and ears. Its two measurements were: Length, 17 inches, (434 mm.); foot, 5¾ inches, (145 mm.)

During October, 1917, the hare was scarce everywhere, although numerous old signs indicated a former abundance. A specimen collected on the 29th had affected a substantial change from the summer coat. Color: Ventral region extending to the throat and including the legs, buttocks, ears, and line anteriorly from eye to ear, nearly pure white. Ring around the neck and on the lower cheek, dirty-brownish white, darkest on the latter. Dorsally, conspicuous brown from shoulders to rump, much suffused with whitish. Fur over nasal and entire frontal, brown, mixed sparingly with white. Upper fringe of the ear, black. Length of hair on the back, 25 mm.

NORTHERN VIRGINIA DEER, *Odocoileus americanus borealis* Miller.

Deer occur, but are not common at Ridout. Whether the moose which are numerous there, exert a positive detrimental influence against the increase of the former is problematical. Probably the general arboreal conditions are not highly favorable to the deer. East of Ridout in all the country surrounding Metagama, Forks, Fluorite and Pogma, I understand the deer are extremely common, supplanting the moose almost entirely. After a fresh snowfall in November, 1917, I saw two deer trails north of Ridout but in October, 1918, none were seen. A trainman reported seeing a fine big buck in the C.P.R. ballast pit a short distance west of the station.

MOOSE, *Alces americanus* Jardine.

Moose are very common in the general vicinity of Ridout and reported in numbers at all points from Cartier to the north shore of Lake Superior. The past fall (1918) was exceptionally favorable for observing these animals. If the weather is mild they frequent the waterways comparatively late in the season. During the past season individuals could

be seen almost any day until the beginning of the last week of October. Previous to that time I saw nine individuals and secured a young bull. As cold weather approaches they retire to the higher woods. On traversing this same general region on about a forty-mile canoe trip commencing Oct. 22, 1917, we failed to see a single animal and attributed it to the very early formation of thin shore ice, which caused the moose to leave for higher situations.

Although individuals of *americanus* from northern Ontario are not recognized as the largest variety, some attain a very respectable size. Some heads taken out of that country I was told, had an antler spread of from fifty to sixty-two inches. Two bulls observed at fairly close range from the canoe could I believe closely approximate those figures.

Mr. Visser and I were afforded a splendid opportunity for hearing a cow "call" during the afternoon of Oct. 8. The canoe had just silently rounded a bend in the river when we noticed indistinctly, a cow, standing among low growth upon the bank; first revealed by the whitish lining of the ears. Meanwhile the canoe with scarcely a ripple drifted nearer and nearer but she made no move, apparently overcome by curiosity. With ears cocked forward and long pendant muzzle slightly projected, she surveyed perhaps the first human being in her life. When within a distance of about thirty yards she lifted her muzzle slightly and called softly; the effect was peculiarly pleasing—low, tender, pleading, a single syllabled bleat of strange, but soft quality, quaveringly inflected, that seemed vaguely in keeping with the vast hush of the solitude. The next moment a young bull was seen slipping silently away among the spruces, where until this time he had remained discreetly hidden. Even then the cow seemed in no hurry to depart.

WOODLAND CARIBOU, *Rangifer caribou* (Aud. & Bach).

The woodland caribou is only a straggler at Ridout according to all I could learn. Mr. Visser told me of one killed in the vicinity a few years ago but says they are rare. The great number of moose in the country has a tendency, I believe, to drive the caribou from this range. Preble[1] alludes to similar circumstances on information received during his Hudson Bay expedition.

The range of the moose and caribou seems to be gradually shifting of late years. Miller[2] says of the caribou "very abundant on the north shore of Lake Superior" and regarding the moose "occasionally found, but as a straggler only." In respect to this and information received from different parties in the north, the condition now seems to be exactly reversed.

(1) Preble, E. A., N.A. Fauna, No. 22, p. 40, 1909.
(2) Miller, G. S., Jr., Mam. of Ont., Vol. 28, No. 1, p. 40, 1896.

CANADIAN SPHAERIIDAE.

BY THE HON. MR. JUSTICE LATCHFORD.

(Continued from Volume XXXIV, p. 34.)

12. SPHAERIUM MODESTUM Prime has been considered by Prime himself to be a synonym of *S. striatimum*. Monograph Am. Corbiculidae, 1865. p. 37.

The rapids in the Rideau above Billings' Bridge, along the right bank, contain in no small numbers a shell which Dr. Sterki regards as *S. modestum* or distinct. He says: "It is certainly not identical with *S. striatimum* Lamarck. Annals Carng. Mis. Vol. X. p. 436.

If the *sphaerium* which occurs so abundantly at Duck Island is Lamarck's *striatinum*, the Rideau shell is not that species. The latter is shorter, more robust, more inflated, and higher at the umbones. The average of ten full grown shells is 10.4 x 8.33 x 6.38—100: 81.62.

The only member of the family found associated with *S. modestum* in the Rideau is the much longer *Musculium transversum*.

13. SPHAERIUM TUMIDUM Baird was described from specimens found by John K. Lord in the Fraser at Sumas Prairie, British Columbia. It is stated to be dark olive in color externally and strongly ribbed. "Within the shell is bluish: long. half an inch; lat. rather more than half an inch."

14. SPHAERIUM SPOKANI Baird is another of the shells found by Lord. It is said to be smaller than *tumidum;* more rounded, and with less distinct striae or riblets; color pale horn, shining; white within. Habitat, "Rivers Spokane and Kootanie."

Referring to Osoyoos Lake, Lord says: [9]"The shore is sandy like a sea beach, and strewn thickly with fresh water shells along the ripple line, has quite a tidewater aspect."

(9) The Naturalist in Vancouver Island and British Columbia, by John Keast Lord, Vol. II., p. 75.

I have not seen any true *sphaerium* from British Columbia, though a number of *musculia* and *pisidia* —several of which proved to be undescribed— were collected there for me by the Revd. Mr. Taylor. From Baird's description of *S. spokani* it appears not improbable that the shell is a *musculium*.

It should not be difficult for some member of the Club resident in British Columbia to procure specimens of the shells found by Mr. Lord. His *physa* would be of especial interest. I have eamined the types of *Physa lordi* in the British Museum, and they appeared to me to differ not a little from the shell commonly designated by that name found near Ottawa, in Meach and Harrington lakes.

15. SPHAERIUM PATELLA Gould is listed by Dr. Sterki as occurring from Northern California to British Columbia. In Vol. XIII of the report of the Harriman Alaska Expedition, p. 138, Dr. Dall mentions that *S. patella* was found in the crop of a duck taken at Pender Island, which is in the southern part of the Strait of Georgia.

16. SPHAERIUM TENUE Prime. This little shell resembles *occidentale*. Some systematists have separated the two species from the other members of the family under the sub-generic name *Corneola*. I have not met with it anywhere; but it has been recorded from Ontario and Yukon Territory by Dr. Sterki. Dr. Dall (loc. cit. p. 139) states that it has been found in the Souris river (doubtless in Saskatchewan) and in the Upper Mackenzie, at old Fort Simpson.

What is supposed to be a variety of *S. tenue* has been described by Dr. Sterki as *Walkeri*. The types were obtained in Lake Michigan in water twenty four meters deep. The same shell was found by Mr. McInnes in the Attawapiscat river.

17. SPHAERIUM VERMONTANUM Prime has probably a wide distribution in the more southerly parts of the Province of Quebec. Prime states that it occurs in Lake Champlain and Lake Mephramagog. A shell very like *vermontanum* is found in the County of Ottawa, near the Village of Ste. Cecile de Masham. Dr. Sterki says (loc. cit. p. 434) "Specimens which may belong to *S. vermontanum* have been seen from Maine, Quebec and Ontario."

18 SPHAERIUM SOLIDULUM Prime must occur in many localities in Ontario. It is widely distributed in the State of New York, and is listed by Dr. Dall (loc. cit. p. 136) from Brandon, Manioba, and Egg Lake, Alberta

Iowa specimens received in 1883 from Professor Shimeck are pale horn color, shining, and deeply striated. Each adult bears a single dark red band, near the margin in most cases, but varying much in position. Prime gives the dimensions in hundreths of an inch as 56 x 43 x 31. My largest specimen is shorter—12 x 9¾ x 6.7 mm.—but the proportions are identical, 100:77:56.

Other described *sphaeria* which have not, so far as I am aware, been found in Canada, though they doubtless occur here, are in the east, *S. fabale* Prime; and in British Columbia, *S. nobile* Gould, and *S. primeanum* Clessin, both of which are recorded from the State of Washington.

In Dr. Richardson's Fauna Bor. Americana, Vol. III, p. 316, written after his return from Sir John Franklin's Second Expedition, a list of the shells collected includes two *sphaeria* from "Methy Lake, Athabaska" under the names *Cyclas medium* and *Cyclas stagnicolum*. No description is given of either species. All that is stated is that the shells were submitted to James De Carle Sowerby, who was the second in line of a family whose members for nearly a century and a half have been distinguished as artists and conchologists.

The Methy Lake mentioned by Richardson is no doubt the lake on the portage between the Saskatchewan and the Athabasca, east of Fort McMurray, about lat. 56-40 N. and lon. 109-40 W. Dr. B. B. Woodward of the Natural History Department of the British Museum informs me that they do not appear ever to have had Dr. Richardson's shells. *S. tumidum* and *S. spokani* have however been traced by his colleague, Mr. G. C. Robson, who is in charge of the molluscan collection; and figures may be ordered from Miss G. M. Woodward for publication in The Naturalist.

MUSCULIUM.

Musculium is the name now commonly applied to a number of small bivalves formerly classed with *cyclas* or *sphaeria*, but distinguishable by reason of little cups or calyces—the nepionic shells—which project markedly beyond the later grown portions of the valves. The shells, except in one of our species, are thin, pellucid and fragile. All are pale in colour. The striae are fine, and the cardinal teeth small or obsolete. Everywhere in the vicinity of Ottawa they abound in ponds and quiet bays, and occasionally, though rarely, in rapid water. The smaller species are much more alert in their movements than their relatives of the genus *sphaerium;* and the facility with which they single-foot up the sides of an acquarium or the stems of waterplants is little short of marvellous. Every observer of molluscan life should maintain a fresh-water vivarium, even if it consists of no more than the ordinary gold-fish globe. But if small shells are to be studied, gold-fish must be excluded; otherwise the molluscan inhabitants will soon be exterminated.

19. MUSCULIUM TRANSVERSUM Say. This is our largest, and, in certain localities, our commonest

species. It appears to be intermediate between the two genera, but bears in most cases the little cupped beaks distinctive of *Musculium*.

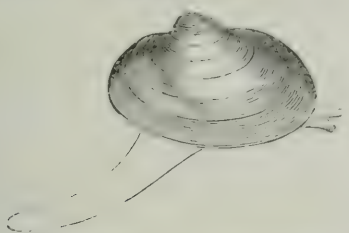


Fig. 3. Musculium transversum.

M. transversum abounds in the Rideau Canal, along the right bank, immediately above the by-wash at Hartwell's Locks, and in the by-wash itself. This is the only *Sphaerium* or *Musculium* I have noticed until the discharge is reached, when a few *S. simile* may be found. Lower down the river, it is not uncommon in the rapids near Billing's Bridge. In the Ottawa I have found it along both shores of the lower third of Duck Island. It seems to prefer mud to sand in that locality, and comparatively quiet waters; but it withstands strong currents over clay in the by-wash, and over coarse gravel in the Rideau River.

The number of shells of this species disclosed at Hartwell's Locks when the canal is unwatered is really phenomenal. Nearly all must perish annually, but in many successive summers no lessening of the multitude had been observed.

20. MUSCULUM TRUNCATUM Linsley. This shell was first noticed in Nepean Bay, near the Broad Street Railway Station. It has since been found in many other localities. In fact it is a very common shell on the Ontario side of the Ottawa, and in the Ottawa itself, at Duck Island, below he sand bars. The Duck Island shells (No. 2371 of my collection) are thought by Dr. Sterki to be "possibly distinct." In Nepean it occurs in great profusion in a wayside pool four or five miles south of Britannia, and west of the road between the third and fourth concessions fronting on the Rideau. East and West of Britannia village it is to be found in early summer in ponds formed by the overflow of the river, and to the south of the Grand Trunk Railway, in the "hole in the hill" on the the Honeywell farm. Later in ordinary seasons, all these ponds become dry; but year after year no diminuition in the numbers of these and other species has been observed. Many shells must surpive because either deeply buried, or like *S. occidentale* immune to dessication.

I have not found the shell in the Province of Quebec, though it doubtless occurs there in suitable localities. Dr. Dall (Harr. Expd. Vol. 13, p. 140) records it as occuring in Methy Lake, Athabasca. One of the Richardson *sphaeria* from the same locality is probably *M. truncatum*.

M. truncatum is very thin, pellucid, and but slightly inflated, the posterior margin is longer in a straight line than that of any other shell of the genus. Exteriorly the shell is sraw coloured; interiorly a very pale blue. The average size is 13.2 x 11.15 x 4.5 mm., or 100:87:56.

The anatomy of *M. truncatum* has been most carefully worked out by Mr. Ralph J. Gilmore of Cornell University: Nautilus, Vol. 31 p. 16 *et seq.* His figure, which may be regarded as applicable to the entire genus, I am enabled to reproduce through the courtesy of Dr. Walker. The margins, anterior and posterior, of the shells ordinarily found near Ottawa are much less rounded than those of the shell figured.

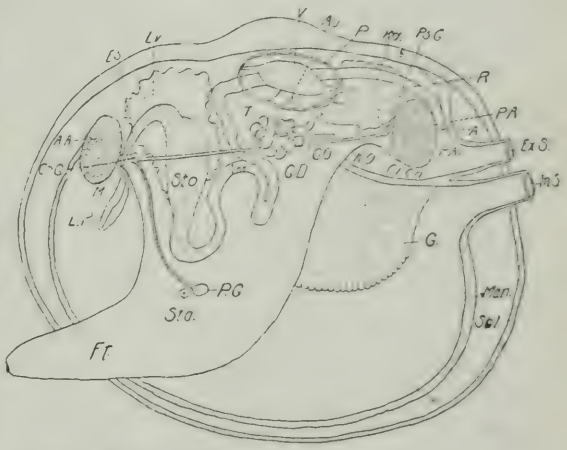


Fig. 4. Musculium truncatum Linsley.

M.—Mouth.
Lp.—Labial palps.
Es.—Oesophagus.
Lv.—Liver.
Sto.—Stomach.
Int.—Intestine.
R.—Rectum.
A.—Anus.
Cb. G.—Cerebral ganglion.
Ps. G.—Parieto Splanchnic ganglion.
P.G.—Pedal ganglion.
Sta.—Statocyst.
V.—Ventricle.
Atl.—Auricle.
K.O.—Kidney opening.
T.—Sperm follicles.
O.—Egg follicles.
G.D.—Genital opening.
AA.—Ant. adductor muscle.
Pd.—Post. adductor muscle.
Ft.—Foot.
Cl Ch.—Cloacal chamber.
Ex. S.—Excurrent siphon.
Int. S.—Incurrent siphon.
G.—Gill.
Man.—Mantle.
Shl.—Shell.
Kd.—Kidney.
P.—Pericardium.

(To be continued).

NESTING OF THE RUBY-CROWNED KINGLET AT GUELPH, ONTARIO.

By J. Dewey Soper.

A very pleasing situation, both unique and rare in the history of Ontario birds has befallen the lot of the O.A.C. campus at Guelph, Ontario. That this happens to be the favored locality for the nesting of the Ruby-crowned Kinglet, (the absorbing topic in question) will be received by local bird students, I am assured, with a certain satisfaction. So far as a careful search of literature on the subject is concerned, it seems that this is the first authentic record for the species in the southern portion of the province. The Ruby-crown, a bird typical of northern forests, pursues its role of nidification usually far beyond the pale of civilization, where even there to find a nest would be a marked event to any ornithological enthusiast. Consider now, the singular opportunity of studying the home life of these sprightly northerners on the college campus of the O.A.C., at Guelph. Granted, this seems to tax credulity, but we have the indubitable evidence to cheer a bird lover on his way.

Before proceeding further it gives me pleasure, in relation to the discovery of this nest, to announce Prof. Crow of that institution as the recipient for full honors. Some time after the rearguard of the Ringlet migration had passed on north, his attention was attracted to the singing of a Ruby-crown for several days in a clump of spruces opposite the museum. Shortly the singing ceased here but was later detected again in the spruces a few hundred yards to the north. At this time the nest was discovered with both birds in attendance and is believed to be the same as earlier noted near the museum. Evidently they had been loitering about the college grounds all spring.

In attempting to frame an analogical reason for this exceptional occurence in relation to the spring migration I was about to describe the latter in point of numbers as one above the average. In fact it appealed to me as an unusual one. It is possible, however, that this impression is merely relative, because of my removal from a point twelve miles west, where during the spring and summer of five years I was accustomed to take notes, and where as fruitful a line of migration does not obtain perhaps as up the valley of the Speed, via Guelph. However true this conjecture may be, there assuredly was no dearth of Ringlets during the past spring; and in the strength and duration of the vernal flight the pair under discussion have evidently been lured from their ordinary design by the close approximation to their ancestral home in the vigorous spruces of the campus.

Reference to my migration records shows the species very common from April 25 until May 3, after which their numbers gradually diminished, with two noted on May 9 and the last one on the sixteenth. To this one I instinctively bade silent farewell as the last of the season. A month later came the surprise when word reached me that Prof. Crow had made the discovery. Together on June 25, we visited the scene. Both birds were readily detected in the immediate vicinity. With the aid of the binoculars we watched their actions as they passed to and fro from feeding the young, examined as best we could the high suspended nest by the same means, and were treated frequently to the consummate song of the male.

On the following morning I visited them again for an hour and also during the afternoon of July 1st. Upon this latter occasion with abundance of rope and an extension ladder I scaled to their pretty domicile and gleaned most of the particulars herein concerning their domestic life. Balanced twenty precarious feet in the air opposite the nest and attempting the successful manipulation of a camera was also a part of the engrossing programme.

In view of the paucity of information concerning the life-history of the Ruby-crown, I conceive it as pardonable to digress somewhat from that brevity which is the soul of wit, in favor of that greater detail which it was my privilege to obtain.

The nest, composed entirely of moss and lined with feathers, was discreetly and beautifully hidden among the drooping branches of a large white spruce. Semi-pensile of construction, and swung twenty feet from the ground, it enjoyed all the advantages of unrestricted space. It was placed at that point where the foliage massed itself the heaviest on the bough, in this instance about four feet from the drooping tip and ten from the trunk. The shaggy pendant foliage so effectually concealed it that visibility was certain only from below. Contrary to most structures of this kind no use was made of the main horizontal limb but was welted directly beneath it to numerous thin, dead, flexible twigs which had been denuded of their needles. These passed vertically down the outside walls of the nest at intervals about its full circumference, undergoing a flexion beneath it where the tips touched and were well secured. Thus it will be seen that the nest actually reposed within a wicker basket entirely free of the main branch. The latter was about two inches above the rim of the nest—just enough to admit the ready passage of the birds. The nest was

perfectly globular in form and incurved sharply at the top. This produced an effect seldom met with in bird architecture. Instead of the usual interior perpendicularity or even an outflare to the walls, the rim rapidly converged, causing its equatorial circumference to bulge bowl-fashion with the throat but half the diameter of the latter. It would be improbable or quite impossible for the wildest tempest to dislodge the young from this cunning chamber. In point of real beauty of materials it yields to many warblers that I know, but like its voice is of remarkable strength and volume for a bird so small.

As near as I could ascertain on July 1st, the nest contained five young. These in certain similitude to that of chicadees were so closely packed in the nest that it seemed folly to entirely disturb them; for having done so for the purpose of making certain on this point left me doubtful as the possibility of having the nest contain them all again. They were a general olive color similar to that of the parents and about two-thirds grown. Both tail and wing quills were well advanced.

Having secured myself in the tree, on June 26, at a point level with the nest, it became a matter of ease to watch the actions of the birds. The nest became less visible from this position, though only a few impassible feet distant, but in comparison to observation from the ground was much superior. During the half hour which I clung to the tree the male visited the nest with food three times and the female twice. The former upon deposition of the food vacated the nest promptly but the female on the contrary, often remained with the young until the return of her mate, when she then slipped quietly away. In this manner the young were left alone for certain periods but sheltered again for longer ones when the female returned.

During observation from the top of the ladder on July 1st, when it was balanced only three feet distant from the nest, many points of interest became known. The detention of the female at the nest I observed, was due to her habit of regularly cleansing the nest of all the sac-like excrement; due to the rapid digestion of the hungry infants, her obligations in this respect seemed never to cease. The matter was probed for with scrupulous care, some consumed by her, and the remainder dropped overboard at some distance from the nest. In this the male never assisted. Candor bids me remark however, that his tireless assiduity in harvesting for the young more than offset this disparity.

In respect to their disposition I discovered the greatest satisfaction. Imagine these two creations, inexpressable in modest beauty, incomparable in graceful deportment, ineffable in euphony of song, passing to and fro in the execution of their poetic labor destitute entirely of fear or suspicion. With my face only a couple of feet distant from the nest the pair continued their work scarcely conscious of my presence. True, at first they hovered above me with sweet queries in their throats and entered the nest from the opposite side of the bough but soon this discretion was forsaken for perfect freedom. Twice, the male warbling an undertone alighted within two feet of my hand on the supporting guy rope of the ladder. A pretty performance and employed only by the male was to flit from the nest and become suspended on whirring wings before me, like a hummingbird before a flower. It seemed like a feathered phantom surrounded by a halo of changing light, supported by some strange and magic force of gravitation. Having satisfactorily examined me in this aerial fashion he would flit easily away perhaps singing as he went.. Thus, without sign of timidity each came near with advances of delightful piquancy, the male engaged in melody and the other quaintly moving about in silence. The first time she uttered any note in my presence was when tapping the limb gently during one of her protracted visits to the young, she flitted with great celerity from the nest calling petulently in a single sweet querulous note identical in pitch and quality to the prelude of the male. She later, on one or two occasions, voiced the same call. Theirs was no suspicious and labored advances; no unconsolable, strident and satirical calls, but conversely, uttering no protest, slipped demurely from limb to limb with sweet-tempered curiosity suggesting certain concessions of welcome.

Only two distinct species of insects were observed to attract the attention of the Kinglets at this time. One, a delicate, winged gnat composed only occasional offerings to the young. The other, a dull whitish insect apparently without wings, was freely and regularly given. The offerings of the female were identical. The male persisted in song near and far during the gleaning of food and ranged for this purpose from ten to fifty yards at least from the nest.

The song of this species has attracted no little comment during its spring migrations, when it is available to so many whom fortune otherwise would never favor. It is of unqualified distinction. For strength and beauty of tone in comparison to its size I regard it as peerless. No poor words of mine can express the supernal sweetness of this production. It wavers and trills in such exquisite tone color, such transparent delicacy, such distilled freshness—what superlatives can do it justice?

DEADLY POISONOUS MUSHROOMS.

By R E. Stone, M.Sc., Ph.D.

Department of Botany, Ontario Agricultural College.

Nearly every year, especially in the late summer and early autumn our woods and fields bear a crop of mushrooms. Many people would enjoy collecting and eating them, but since some of these fungi are deadly poisonous, many are deterred from gathering them because they are unable to tell with absolute certainty the edible from the poisonous forms.

In Ontario there are at least two hundred (200) kinds of fleshy fungi of which sixty (60) occur in abundance, and are large enough to collect for eating. Unfortunately a few of these are deadly poisonous and sometimes occur in quantity. Some of these are also very attractive and always clean.



Fig. 1.—Fly Agaric (Amanita muscaria, Linn). Deadly Poisonous.
From Bulletin 263, Ontario Department of Agriculture, Ontario Agricultural College.

The question is often asked—"How do you tell a mushroom from a toad stool" meaning by toad stool a form that is either inedible or poisonous. There is no simple rule. Occasionally one sees published the old silver test. This is an old idea and still prevalent in some places, especially Italy. In olden days silver was accredited with many magic properties, especially that of turning black in the presence of malign influences, hence, silver would turn black in the presence of poison. This test can not, of course, be relied upon. Another test often spoken of is the peeling test. Some of our mushroom gatherers say that if the outer skin of a mushroom can be peeled off readily, that the mushroom is edible. Unfortunately some of the deadly poisonous kinds will peel beautifully. Others say, collect only those that are pink underneath; this although good advice, unfortunately limits one's choice to but a few of the edible kinds. Still others say, never collect mushrooms in the woods but only in the fields, yards and gardens. This is again, excellent advice but also limits our choice and eliminates many of the very best. There is no simple rule that can be applied; one must learn to know the poisonous forms the same as he knows other plants. In order to enable mushroom lovers to avoid the dangerous forms, the most dangerous forms are described and figured below.

FLY AGARIC (*Amanita muscaria*, Linn). Deadly poisonous.

This fungus appears in July and August in groves and open woods or along roadsides near trees, usually preferring rather poor soil. (Fig. 1.) It is called "Fly Agaric" because an infusion of the plant was at one time used as a fly poison. The plant is typically large and handsome.

The cap is 3 to 5 inches broad, rounded when young, nearly flat when old, yellow or orange or even bright red in color, and covered with numerous angular scales, which are white or light yellow in color and can be easily brushed off. As the cap becomes old it fades out, so that it may become

nearly white and the scales may be washed off by rains.

The stalk is 4 to 6 inches long, about half an inch thick, usually white but often yellowish in color, hollow in age. The bottom of the stalk is enlarged into a prominent bulb which is more or less rough and shaggy or scaly. The lower part of the stalk above the bulb is also shaggy.

The gills are white or slightly tinged with yellow and do not become pink or brown as do those of many edible mushrooms.

weakening of the heart action. Of course, when symptoms such as these appear after eating mushrooms a physician should be sent for immediately.

The system should be freed of the undigested fungus as soon as possible. Strong emetics such as zinc sulphate, apomorphine or warm mustard and water should be used. If these are lacking or produce no effect tickle the throat with a feather or the finger to cause immediate and violent vomiting. This should be followed by a strong dose of castor oil.



Fig. 2.—Deadly Agaric (Amanita phalloides, Fr.) Deadly Poisonous.
From Bulletin 263, Ontario Department of Agriculture, Ontario Agricultural College.

The ring is quite large, white, and firmly attached to the stalk.

The main points to remember about this fungus are:—The yellow or orange cap with loose white scales. Gills white, never becoming pink or brown. Ring large, white, firmly attached to the stalk. The stalk enlarged at the base into a prominent shaggy or scaly bulb and the stalk shaggy between the bulb and the ring.

The poison in this mushroom is known as muscarin. This substance fortunately has an unpleasant bitter taste, so that the plant is seldom eaten even if collected by mistake. The poison does not act immediately, but the symptoms appear in from ½ to 2 hours, and are: vomiting and diarrhoea, with a pronounced flow of saliva, suppression of urine, giddiness, uncertainty of movement, derangement of vision. This is followed by stupor, cold sweats and

THE DEADLY AGARIC (*Amanita phalloides*, Fr.) Deadly poisonous.

This fungus is called the Deadly Agaric because it is extremely poisonous and there is no known antidote for the poison. (Fig. 2).

The plant usually grows in the woods or along the borders of woods, but has also been known to appear in lawns. It generally appears in July and August. It is quite variable in color, varying from pure white through yellowish to olive.

The cap is 1.5 to 5 inches broad, at first bell-shaped, finally nearly flat, fleshy, viscid or slimy when fresh, smooth, often with a few loose white scales. The color varies from white, through yellow to olive green, the dark forms being more common in Ontario.

The stalk is 2 to 8 inches long, ¼ to ½ inch thick, hollow, white or colored like the cap, but

lighter in shade, becoming discolored on handling. It ends in an abrupt bulb which generally has a sharp rim standing up around it, forming a sort of cup, called poison cup or volva. This poison cup is usually deeply buried in the soil, so that in order to find it it is necessary to dig the plant up.

Gills white and remain white, never becoming pink or brown.

The ring is white, prominent and is high up on the stalk close to the cap. The ring is attached to the stalk, not loose as in the smooth white mushroom or parasol mushroom.

The poison in the Deadly Agaric is phallin. This poison, unfortunately, has no pronounced taste or odor and gives no warning of its presence. Unfortunately, also, the symptoms of poisoning do not manifest themselves until 9 to 14 hours after the fungus is eaten. There is then considerable abdominal pain, and there may be cramps in the legs accompanied by convulsions and even lock-jaw and other tetanic spasms. The pulse is weak and abdominal pain is rapidly followed by vomiting and extreme diarrhoea, the intestinal discharges assuming the rice-water condition characteristic of cholera. These later symptoms persist, generally without loss of consciousness until death ensues, which happens in from two to four days.

There is no known antidote for phallin. The undigested portions of the fungus should be removed from the stomach and intestines by methods similar to those suggested under Fly Agaric. If the poison already absorbed is not too great, it may wear itself out and the patient recover. Of course, when symptoms of poisoning appear a physician should be sent for immediately.

THE DESTROYING ANGEL (*Amanita verna*, Bull). Deadly poisonous.

This fungus is probably the cause of more cases of mushroom poisoning than any other. (Fig. 3).

The plant is pretty, clean, pure white and attractive.

It usually occurs in the woods or near them, but may grow in lawns newly made from forest soil. It is generally found in June and July.

The cap is 1.5 to 4 inches in diameter, at first bell-shaped, later becoming nearly flat; pure white, shining, viscid or slimy when fresh.

The stalk is 2 to 6 inches long, ¼ to ½ an inch thick, pure white, hollow in age. The stalk ends in an abrupt bulb, with a free border closely surrounding the base of the stalk and forming the poison cup or volva. This may be seen in even young specimens. This poison cup is buried in the soil, so that in order to see it it is usually necessary to dig up the plant. For this reason wild mushrooms growing in the soil should always be dug, not pulled up or broken off.

The gills are pure white and remain white, never becoming pink or brown.

The ring is broad and high up on the stalk, just under the cap. It is firmly attached to the stalk and is not loose, as in the smooth white mushroom.

Since this is our most poisonous mushroom its main characters should be thoroughly learned and remembered.

The cap is pure white, shining and slimy when fresh. The stalk is pure white, ending in a distinct poison cup or volva. Gills pure white and remain white. Ring white, broad, high upon the stalk to which it is firmly attached.



Fig. 3.—Destroying Angel (Amanita verna Bull.) Deadly Poisonous.
From Bulletin 263, Ontario Department of Agriculture, Ontario Agricultural College.

The poison in this fungus is the same as that in the Deadly Agaric and the symptoms of poisoning and treatment are the same.

SCARLET CAP (*Russula emetica*, Fr.) Reputed to be mildly poisonous.

This fungus occurs very commonly in the woods from summer till autumn. It gets its name from the bright scarlet cap. (Fig. 4). It is hot and peppery to the taste and some report it to be mildly poisonous, while others say that it is edible.

The cap is 1.5 to 3 inches wide, thin, brittle, deep pink to rich red; furrowed near the edge,

rounded when young, depressed in the centre when old.

The stalk is 2 to 3 inches long, white or tinged with yellow. Very brittle. There is no ring and no volva or poison cup.

Besides the scarlet cap, some of the forms with milky juice are mildly poisonous. They are very hot and the milk is not reddish, as with the Orange Flow *(Lactarius deliciosus)*.

There are some mushrooms which have tubes in place of gills. Some of these are edible and others poisonous. The poisonous ones have a flesh that changes color when cut or broken or have tubes with red mouths. There are a few mushrooms that have clay-colored gills and a cobwebby veil that should also be avoided.

GATHERING WILD MUSHROOMS.

When one is gathering wild mushrooms a basket is the best receptacle for carrying them, as different compartments may be made for holding the various kinds, and thus keep from crushing and spoiling the more tender ones.

When collecting mushrooms for the table they should never be pulled up or broken off. In the deadly poisonous mushrooms the most marked characteristic, the poison cup or volva, is deeply buried in the soil. If the plant is pulled up or broken off the poison cup is lost and it is impossible to distinguish the poisonous kinds from certain edible ones. After a mushroom has been carefully dug up and examined and the collector is certain that it is edible, the lower part of the stalk may be cut off to get rid of the dirt. It is often very difficult to determine mushrooms from the young or button stage, so that unless buttons are accompanied by mature plants, they should generally be avoided. In case of doubt the fungus should be discarded or the complete specimen shown to one who knows mushrooms very thoroughly.

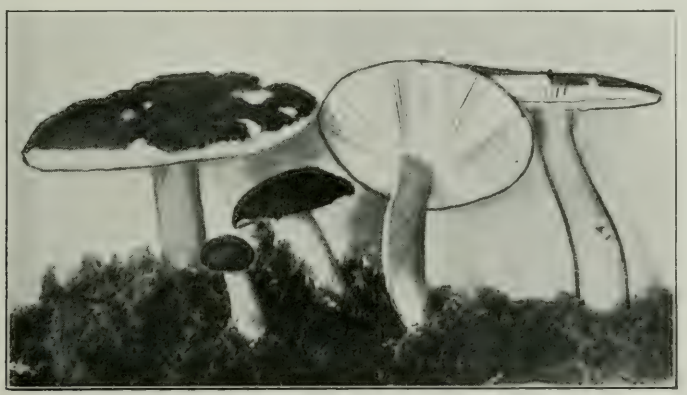


Fig. 4.—Scarlet Cap (Russula emetica Fr.) Mildly Poisonous.
From Bulletin 263, Ontario Department of Agriculture, Ontario Agricultural College.

Many mushrooms are wholesome when fresh but become dangerous when they begin to decay, or show evidence of the work of insects or worms.

JACK-O-LANTERN, False chantarelle. *(Clitocybe illudens* Schw.) Mildly poisonous.

This is a large mushroom growing in clusters on decaying wood. At first the plants are a clear yellow but later become brownish. When seen in typical clusters it is very attractive but is mildly poisonous. Fresh specimens when placed in the dark give off a pale yellowish light, i.e. they are phosphorescent.

The cap is from 4 to 6 inches broad and more or less funnel-shaped, yellow; stem 6 to 8 inches long, solid, yellow, tapering towards the base. Gills yellow and running down on the stem. There is no ring and no poison cup or volva.

Some people can eat this mushroom but to most it is distinctly poisonous, producing nausea, vomiting and diarrhoea.

When these symptoms occur, following the eating of mushrooms, the digestive system should be cleared by purgatives and a physician sent for.

RULES TO BE OBSERVED IN GATHERING WILD MUSHROOMS.

It is impossible to give a simple rule or test for detecting poisonous mushrooms. Care must be taken to observe the characteristics of each mushroom gathered.

The following rules, if carefully followed, will enable one to avoid the poisonous forms:—

(1) Avoid fungi when in the button or unexpanded stage; also those in which the flesh has begun to decay, even if only slightly.

(2) Avoid all fungi which have stalks with a swollen base surrounded by a sac-like or scaly envelope, especially if the gills are white.

(3) Avoid fungi having a milky juice, unless the milk is reddish.

(4) Avoid fungi in which the cap is thin and very brittle, and in which the gills are nearly all of equal length, especially if the cap is bright-colored.

(5) Avoid all tube-bearing fungi in which the flesh changes color when cut or broken, or where the mouths of the tubes are reddish and in the case of other tube-bearing fungi experiment with caution.

6) Avoid fungi having clay-colored gills and a spider web or woolly ring on the stalk.

(7) In case of doubt discard the plant.

Mushrooms Which May Be Gathered.

The foregoing rules are given as a warning against comparatively few plants; the edible mushrooms are more numerous and those that may be gathered are as follows:—

All the puff balls and coral fungi; any of the hedge hog or spiny fungi and the morels; also any mushroom whose gills become brown; mushrooms having reddish or orange milk; all mushrooms that melt down into an inky liquid when mature; many mushrooms with white gills, but care must be taken to be absolutely certain that they have no poison cup or volva.

Learn to Know the Mushrooms.

Before attempting to eat a large number of mushrooms one should learn to know them by their individual characters, the same as he would learn to know berries or other wild fruit. The best way to do this is to secure a book describing the various kinds and then gather the different ones and compare them with the descriptions and illustrations. Another way is to go out into the woods and fields with someone who knows the mushrooms and have the different kinds, both poisonous and edible, pointed out and the characters explained.

Still another way to learn the mushrooms is as follows. Carefully dig up the mushrooms so that all the fruit body including the very base of the stem is present. Wrap in dry paper, taking care not to crush the specimen, attach a note describing where the plant grew, i.e. fields, woods or road side; whether it grows in the ground, or wood and the color of the fresh specimen. The specimen should then be enclosed in a strong cardboard carton or wooden box and sent in to the Department of Botany, Ontario Agricultural College, Guelph, Ont.

If the specimen is carefully packed, it will arrive in fair condition and the name and properties of the mushroom will be sent to you by the next mail.

Books that Describe Mushrooms.

McIlvaine, Chas.—One Thousand American Fungi.

Hard, M. E.—Mushrooms, Edible and Otherwise.

Atkinson, Geo. G.—Mushrooms, Edible, Poisonous, etc.

Marshall, Nina L.—The Mushroom Book.

Gibson, Hamilton—Our Edible Fungi.

Murrill, W. A.—Edible and Poisonous Mushrooms.

Stone, R. E.—Mushrooms of Ontario: Ontario Department of Agriculture, Bulletin No. 263.

NOTES ON THE SUMMER BIRDS OF THE GASPE PENINSULA, PROVINCE OF QUEBEC.

By Charles W. Townsend, M.D., Boston.

In planning a trip to any spot in North America, one naturally turns to the indices of the Auk and the Bulletin of the Nuttall Ornithological Club in order to learn what ornithological work has been done in that region and what birds one may expect to find. As far as I can discover there has been no list published and no mention made of the birds of the Gaspé Peninsula in these journals. The only notes of this region published by ornithologists elsewhere that I can find are by Mr. Wm. Brewster, [1]; Mr. Frank M. Chapman[2] and Mr. P. A. Taverner[3]. In none of these notes is there any attempt to list the birds of the region, and it therefore seems worth while to present the following preliminary list. The generosity of Mr. Taverner in putting his notes, made chiefly at Percé in the summers of 1914 and 1915, at my disposal has made this list of much greater value than if my own notes alone were to be drawn upon.

I feel sure that Mr. Taverner's work in these regions has had the greatest influence in determining

(1) Notes on the birds observed during a summer cruise in the Gulf of St. Lawrence. Proceedings, Boston Society of Natural History, Vol. 22, pp. 364, 412; 1883.

(2) Bird studies with a camera, New York, 1900, pp. 128-145. Gannets of Bonaventure, Bird Lore, Vol. 1, 1899, p. 71.

(3) The Gannets of Bonaventure Island, The Ottawa Naturalist, Vol. 32, 1918, pp. 21-26.

the Provincial Government to make Percé Rock, Bonaventure Island and Bird Rock near the Magdalens, bird reservations. This splendid piece of work was accomplished in 1918 and the wonderful colonies in these three localities are now protected for all time. These reservations are of great value and interest not only to ornithologists but to the general public and they will become more and more known and visited. Both Percé Rock and Bonaventure Cliffs have a beauty and grandeur of size and form and coloring that is unequalled along our Atlantic Coast, but their wonderful charm is increased manyfold by the variety and abundance of the bird life that adorns them. The Provincial Government, which has made them reservations, together with Bird Rock off the Magdalens, is to be greatly congratulated, and it is to be hoped that this is but the beginning of their work and that other reservations may be added elsewhere, especially along the Labrador Coast where they are so much needed. The splendid work of the Audubon Society in the United States may well be taken as a model.

The Gaspé Peninsula projects like a lower lip at the mouth of the St. Lawrence River into the Gulf of St. Lawrence. It lies north of New Brunswick from which it is separated by the Bay of Chaleur and the Restigouche River. A single track railway runs along the southern shore nearly to the end of the peninsula at Gaspé, and for a few miles along the northern shore as far as Matan. A carriage road follows the shore of the whole peninsula and there are a few short side roads extending but a mile or two into the interior which is an uninhabited region of forest and mountains. Villages inhabited for the most part by fishermen of French and Channel Island descent, are scattered along the coast.

The geology of the Gaspé Peninsula is most interesting and complicated. At Percé, for example, are outcrops of Cambrian, Silurian and Devonian limestones with strata almost vertical, overlaid in places with a great mantle of horizontal red sandstones and conglomerates. The mountains near the north coast are of gray Silurian limestones and serpentines. At the places visited there was no evidence of general glaciation, but only of slight and local glaciation. There are few lakes and the streams are deeply cut.

The vegetation is of the Hudsonian type,—the forest is largely of spruce,—black and white, and balsam fir. Arbor vitae, canoe birches and aspens are common. A few white pines, larches, yellow birches, mountain ashes and sugar maples are to be seen. The avifauna is largely Canadian with a number of Hudsonian and also of Transition forms.

The itinerary of my trip was as follows:—

Crossing on July 5th, 1919 from Campbellton, New Brunswick, where the Restigouche River meets the Bay of Chaleur, I spent two days at Cross Point in the Township of Mann, and had an opportunity to observe the birds in the woods and fields there. July 7th was occupied in travelling the 150 miles to Cape Cove, from which I was taken by automobile nine miles to Percé. The railroad journey was such a leisurely one, with so many breakdowns of the engine that I was able to see something of the birds and flowers of the region. At Percé, a quaint little French fishing village with beautiful setting of rock, cliff and mountain, I stayed until August 6th and explored the neighborhood including Bonaventure Island, Corner of the Beach and Barachois. On the latter date I went by motor boat some twenty-eight miles to Grande Grève near the eastermost tip of the Forillon, the narrow peninsula that stretches between Gaspé Bay and the Gulf of St. Lawrence. Here I stayed until August 25th and explored the neighborhood including a walking trip through Cape Rosier and Griffin Cove to Fox River, and back through the "portage" to Peninsula, and along the southern coast of the Forillon to Grand Grève. A day was spent in the neighborhood of Douglastown on the southern side of Gaspé Bay and another at Gaspé and on the lower waters of the York River.

Before presenting the annotated list I would say a few words about the two new bird reservations at Percé.

Percé Rock is an isolated mass of nearly vertical strata of Devonian limestone some 1500 feet long, and 288 feet high at its highest point and 300 feet wide at its greatest breadth. It is connected with the shore only at low tides by a bar two or three hundred yards long. At the outer end stands a smaller isolated mass or pinacle. The main rock is pierced by an arch with a span of about eighty feet and from this the rock receives its name. Percé Rock is an object of exceeding beauty not only on account of its striking shape and great size, but also on account of the brilliancy and variety of its colouring. Its beauty and interest are greatly enhanced by its bird inhabitants which throng its inaccessible summit and form a circling cloud. Breeding Kittiwakes to the number of about 400, occupy the shelves and niches of the northern face over the arch. Double-crested Cormorants, a thousand or more and Herring Gulls to the number of 2,000 breed on the flat surface of the summit. A few Black Guillemots nest in some of the holes and corners on the sides of the rock.

I was enabled to make a fairly intimate study of the home life of these birds of the summit through the kindness of Mrs. Frederick James, whose late husband was the beloved artist of the little village of Percé. At her invitation I spent many interest-

ing hours looking through her powerful telescope from the piazza of her house on Cape Cannon.

Bonaventure Island, is three miles distant from Percé and is of still greater value and importance. It is about three miles long and a mile and a half broad. The outer side faces the sea in sheer cliffs of horizontal strata of red conglomerate and sandstone four and five hundred feet high. On the cliffs and niches and along the shelves, tier above tier nest a very large and notable collection of water birds. The most important of these in size and numbers are the Gannets which are most numerous towards the southern end. Mr. Taverner has estimated their numbers to be 8,000. Herring Gulls breed on the cliffs to the number of several hundreds if not thousands. A smaller number of Kittiwakes nest near the northern end of this outer side of the island on vertical cliffs that possess but few and small niches. Murres and Razor-billed Auks, perhaps 500 pairs of the former and 100 of the latter also lay their eggs on the cliffs. A small number of Puffins and a few Black Guillemots are also breeders there, while in the holes and crevices on top of the cliffs Leache's Petrels nest. No Cormorants breed here but visitors from Percé Rock may often be seen.

I visited Bonaventure Island three times, passing in a motor boat close under the cliffs and camping and spending two days on each of the first two occasions; the last time I spent only the day. It is possible to take up a position on the edge of the cliffs where one can sweep with a glass, tier on tier of nesting Gannets and be within thirty feet of the nearest. As they fly by they are almost within arm's reach. With an eight power prismatic binocular and a thirty power telescope I spent many hours watching these birds. With the expert aid of Willie Duval, descendant of of Captain Peter John Duval the original owner of the island, I was able to climb a hundred feet or more up the cliffs from below and crawl along a ledge close to Puffins and Murres. Mr. Taverner[4] has vividly described such an adventure.

ANNOTATED LIST.

1. *Gavia immer.* Loon.
 One flying by Bonaventure Island. Mr. Taverner reported a few.
2. *Fratercula arctica arctica.* Puffin.
 Thirty or forty pairs of these birds breed in the deep clefts or holes in the cliffs of Bonaventure Island, mostly at the northern end of the eastern cliffs.
3. *Cepphus grylle.* Black Guillemot.
 Common and very tame all along the rock shores, breeding in holes and in the clefts between the strata of the rocks. Young were first seen in the water August 1st.
4. *Uria troille troille.* Murre.
 About five hundred pairs breed at Bonaventure Island. I met with them at other places on the coast, but do not know whether they breed away from the island or not. Several times I saw Gannets that had alighted in the same niche in the cliffs drive the Murres out. Mr. Taverner reports seeing a number of *ringvia.*
5. *Alca torda.* Razor-billed Auk.
 Perhaps a hundred pairs breed at Bonaventure Island. They were to be seen singly, sometimes among the Gannets and in companies of two or three often with Murres in clefts or ledges smaller than those frequented by the Gannets. Flocks of ten or fifteen Murres on the water generally included one or two Razor-billed Auks.
6. *Rissa tridactyla tridactyla.* Kittiwake.
 About 400 breed on the northern face of Percé Rock near the arch and about as many on the cliffs of Bonaventure Island.
7. *Larus marinus.* Great Black-backed Gull.
 A few seen in July. More common in August. No evidence of breeding.
8. *Larus argentatus.* Herring Gull.
 Abundant. Breeds on the top of Percé Rock to the number of about 2,000, on the cliffs of Bonaventure Island and the Murailles at Percé, on the sea cliffs below Mt. St. Albans and on the Bon Ami cliffs near Grand Grève and doubtless on many other cliffs of the Peninsula.

Cod fishing is the chief industry of the coast and the fish are cleaned and split at tables on the beaches or on fishing stages. The heads and entrails are left where they fall and are eagerly sought by Herring Gulls, who gather when the fish are brought in, and do important work as scavengers. They are very tame and may often be seen searching for scraps on empty boats riding at anchor. I have counted as many as 30 on one boat. Until the young are on the wing none but full plumaged adults are to be seen; no birds with black tips to their tails were found in these flocks. The young appeared in the air the last week in July.

A cloud of Herring Gulls, was constantly flying about Percé Rock and their cries were always to be heard by day and frequently by night. The bugle-like courtship song frequently resounded and fighting among the adults on the Rock was frequent.

(To be continued.)

(4) Ottawa Naturalist, XXXII, 21-26.

THE CANADIAN FIELD-NATURALIST

VOL. XXXIV. OTTAWA, ONT., MAY, 1920. No. 5.

BIRDS AND HOW TO ATTRACT THEM ABOUT OUR HOMES.

By J. C. Middleton, London, Ont.

Most of us take a good deal of pride in the surroundings of our dwelling places, and have succeeded in making them real beauty spots. However in most cases with city dwellings we have not the opportunity of carrying out a good many of our cherished wishes, still our surroundings are largely what we make them, individually or collectively. What could be more charming than being surrounded by an abundance of bird life the year round?

Now without trees or shrubs we would have very few birds as they provide protection and shelter from extreme heat and cold, and from the searching eyes of natural enemies such as the cat, dog and birds of prey. They also provide resting and sleeping places as well as meeting places for many of our most favorite birds. Important as all these reasons are, trees, shrubs and plants are indispensible to most bird life for another great reason, that is they provide food either by producing or sustaining it. It is quite true we may have plenty of house sparrows and perhaps birds that feed while on the wing, such as the swallow or martin, without trees, but these are only exceptions which go to prove the general rule. It goes without saying that dense foliage is essential for good protection. This can be best obtained by the use of evergreens, which if planted in clumps or hedges will give ample protection both for summer and winter, their growth is much thicker and heavier than our deciduous trees. A good hedge of spruce trees is a great attraction for birds in the cool nights of early spring, or in the fall, and a thick cover of some sort of evergreen is essential if we are to have the birds stay with us during the winter.

Most close growing shrubs and trees are valuable for nesting places. Of course many birds nest on the ground in clumps of grass or thickets, but these are not likely to build in our gardens unless we have some quiet and unmolested spot.

The different fruits and seeds being produced and ripened at the different times of the summer are either eaten, perhaps when only partly matured, (such as the cherry) or on the other hand hang on long after the leaves have fallen to serve as food in fall and winter.

The myriads of leaf insects, to say nothing of the moths and fruit pests, form a large portion of the birds' bill of fare. Then again what about the borers, and other insects which live either in or under the bark?

The sap of trees is also enjoyed by some birds. For instance, the sapsucker will almost always be found at work where the Balm of Gilead poplar trees are plentiful.

What is our deduction from these facts? Is it not a fact the more nearly we can create these conditions in our gardens, the more birdlife we are likely to have, for after all the two great essentials to success in attracting birds are an abundance of food and ample protection.

Now I don't suppose it would be either practical or wise to have all our garden space taken up with plantings suitable only for bird life; most of us are far too fond of flowers to allow this, but on the other hand how often are gardens planned entirely without a thought for the welfare of our birds. With our system of laying out our cities in blocks what would be easier than to have our back garden separated by hedges. I am quite sure you will agree with me that the garden would look very much more artistic and natural than they are with our present system of board fences. There are many different kinds of trees, plants and vines which are quite adaptable for hedges. If this system could be established, just think what it would mean for the birds, and not only for the birds for I am inclined to think that living between board fences has a very detrimental effect on all our natures, and that if we could but trace where that hard or unsympathetic spot in our natures originated we would find, perhaps back a generation or two, that the rude obstruction of a high board fence around our gardens has had a great deal to do with it.

It would be difficult to name all the best trees and shrubs. Mr. Baynes in "Wild Bird Guests" gives a very complete and quite an extensive list of these with their relative fruiting seasons. I quite agree with Mr. W. E. Saunders that our own native trees are likely to prove more attractive than imported ones. We naturally take to our favorite



1. Upside down feeding box; 2. Upside down feeding slab; 3. Bird Curate placed on window sill; 4. Seed hopper; 5. Mrs Berry's wired dish; 6. Feeding log.

dishes, so with the birds, they are far more likely to be attracted by a clump of our red native cedars than by trees which they have never seen before. Of course this does not mean to say that we should not plant trees such as the Mulberry, whose fruit is specially attractive, but as a rule our native berry bushes, vines and trees are the best to plant.

Perhaps the most interesting of our bird guests during the nesting season are those which occupy our bird houses. These are so well known that I need not enumerate them. It might be well to dwell for a little on the most suitable styles and locations of some of the preference for what he, or perhaps I had better say she, considers a properly made house. How do we know whether a bird likes a certain style of house or not? This is only found out by observation and experiment. Perhaps Baron Von Berlepsch has achieved more along this line than any other student, having devoted a tremendous amount of time and practically the whole of his large estate to these studies, and bird houses constructed after his ideas have proved most successful. I mention this only to show that through experimenting it is quite possible to find out what kind of houses are preferred by the different birds.

A standard Flicker house would be made from a log say, twenty-four inches long and about eight or nine inches in diameter. The entrance hole, two and a half inches in diameter, should be placed quite near the top. To hollow out the log it is best to cut it in half lengthwise and then with a gouge or chisel shape out the cavity into a pear shaped hollow extending sixteen inches below the entrance hole making half the cavity in each piece of the log and the big end towards the bottom. Place the pieces together again and fasten tightly with a piece of soft wire at either ends of the log; then cut the top of the log sloping, with the back about one inch higher than the front; then nail a piece of board to this having it extend fully three inches beyond the log on both sides and front thus forming a shelter to the entrance hole which is quite important.

Those who are interested in finding out about any special house will find complete directions for all houses in N. M. Ladd's "How to Make Friends with the Birds."

It is a good idea to place a mixture of sand and sawdust in all Woodpeckers' houses as they do not carry in nesting material. Fill the house about one third full, they will soon remove any surplus.

Don't make the mistake of making two compartments in the one house, as houses of this sort will seldom be occupied, and if occupied only one compartment will be used. Purple Martin houses are an exception to this rule. With these houses the more rooms or apartments, each with a separate entrance, the better your house.

The placing of bird houses is very important. Care should be taken in selecting suitable locations which should be in open places as far as possible. When hanging the house see that the entrance faces the sheltered aspect, and that it is shaded from wet and storm as much as possible.

All houses should be cleaned and repaired as early as possible each season.

Don't make the mistake of placing a Flicker and Wren house on the same tree as if these should both be lucky in attracting occupants the Wren will take the first opportunity of visiting the Flicker's nest in the absence of the owner and puncturing the eggs. This happened in my garden last season, not only in the Flicker's nest but also with a Robin's nest which was built in the same tree.

Hang out wadding, wool, bits of string, and any other nesting material. Do this early as it is often the means of attracting a pair of birds to nest in your garden.

A bird bath is a splendid attraction. This should be placed in the open thus affording the birds a clear view of any approaching enemies, such as the skulking cat. A bath with a graded bottom is preferable. This should start at half inch and slope gently to not deeper than two inches. A fine misty spray is a splendid addition, also have perching accommodation nearby. A dust bath located in a sunny situation is much enjoyed by birds. This can be easily made by filling a flat tray or box say two or three inches deep with any sort of fine dust, preferably fine sand, with a small portion of slacked lime thoroughly mixed. A bath which will be much frequented especially by Robins and Sparrows can easily be made by securing a large plant saucer and placing it in a sunny location on a box or stool to raise it one or two feet from the ground, the only difficulty with this is that you will probably find that you will have to fill it several times during the day, as an enthusiastic Robin will splash considerable of the water over the edge and when this is repeated several times the bath soon becomes empty.

Besides serving as baths these basins of water are a great blessing in hot weather, as drinking pools, and if kept regularly filled will be visited by hundreds of birds during one day.

There is one golden rule to be observed if we are to make the birds feel perfectly at home in our gardens, that is that no cat or dog be allowed to roam about the premises. The proprietor must see that this is obeyed. Our movements have considerable effect on wild life. If we are gentle and even in our ways of going about the garden, and are not always appearing to be prying after the birds we will find that they will soon learn to treat us as friends. There is no better illustration of this than

with the Humming Bird. We all know how alert and absolutely instantaneous these birds are in their movements and yet, if approached in a gentle even way it is quite possible to gain their complete confidence. I have used an artificial flower made of bright paper, with a small bottle as a centre, filling the bottle with a mixture of honey and water, and by first letting them get acquainted with the special quality of the nectar of this rare flower have afterwards been able to have them come to my hand and sip from the bottle without any decoration. My experiments have been mostly carried on in the fall, and I am inclined to think that it would be a far more difficult proposition to tame these birds during the nesting season. This would apply to almost all birds as nature has made them specially timid and watchful during the time they are rearing their young.

Early in September it is well to hang out some feeding devices so as to attract any birds that might be persuaded to stay for the winter, and as with nesting materials it is a good plan to have them out early, however, just here I would like to say that it is far better not to start feeding the birds if we are not determined to do it regularly throughout the winter.

The feeding of birds in the winter is perhaps one of the most interesting sides of bird study. As already stated we must have some thick clumps or hedges of evergreen trees for protection if we are to be successful in keeping the birds about our gardens during the winter, but with this and careful regular feeding it is wonderful what can be done along this line. A feeding station arranged at a suitable window is certainly a source of great enjoyment during the long winter months. I would like to explain some of the feeding devices which I have found successful, also some methods of taming the birds and preparing their food.

Having selected our favorite window our aim will now be to entice as many birds as possible to this spot. If we are fortunate enough to have one or more trees within ten or twenty feet of the window we will find this a great aid. A brush pile say about ten feet from the window is necessary, as birds do not feel comfortable without a certain amount of cover. The larger this is the better. Another very good thing is to place artificially a good thick evergreen tree which will serve as a wind break and also make the birds feel more at home. There should be pieces of fat hung or fastened to trees for some distance around. Always have the best supply at your feeding station. It will not be long before you are rewarded with the arrival of a Downy Woodpecker, a Nuthatch, or a Chickadee. Once the birds have found your station all outlying feeding places should be abandoned. If you are ambitious, you will frame up your window with rough branches and make an artificial window sill of a rough board, say about twelve inches wide, your reason for doing this is to have a place for the birds to feed should you be successful in getting them tame enough to come to the window. At first the birds will be quite shy, but if you are careful not to frighten them at any time they will soon become comparatively tame.

A splendid device for taming some of the more timid birds is a wire strung from the top of your window frame to the nearest tree, the outer end should be a foot or two higher than the end at the window so as to give the wire a slight slope down to the window. This will give anything that is hung on the wire a tendency to shift towards the window instead of further away as would otherwise be the case. The wire must be strung quite tightly so as not to sag when it is carrying its load. Now the idea is to hang feeding devices on this wire, first at the farther end and when the birds have become used to going to them, gradually shift closer to the window. In this way it is possible to get many quite shy birds to feed from your window sill. We have succeeded in getting the Cardinals to feed from our window sill in this way.

At first it may be found a good idea to sprinkle coarse grains such as oats, corn and perhaps some finer seeds, say millett, hemp, etc., in a specially prepared spot in your brush pile, but this will probably attract more house sparrows than anything else, and if you do not resort to some means of outwitting them they will soon monopolize your station, eating everything you exhibit excepting the whole corn.

Generally speaking you can divide the birds that will feed at your station into two classes, the seed eaters and the suet or fat eaters. This division is not absolute, but the Sparrows, Juncoes, Finches, and Cardinals, are preferably seed eaters. The Chickadees, Nuthatches, and Woodpeckers prefer suet or fat, while the Bluejay will do ample justice to either if it gets the chance.

The Chicadees are probably the most interesting and most easily tamed of our guests and our station would indeed be quiet without them.

The nature of a bird is to fly away as soon as it secures a morsel that is good to eat; now recognizing this fact and remembering that our object is to tame and see as much of the birds as possible, we should guard against this. How? Well, when putting out *suet* don't put out *suet*, but buy beef fat. Of course I do not need to explain this to the ladies but to the men I would say that suet crumbles and breaks up into pieces just suitable for the birds to fly away with, while beef fat holds together and requires that each mouthful be pecked off. Result—

bird has to stay on the job in order to get a meal. Also in putting out nuts for the Chickadees and Nuthatches see that these are reduced to a fine powder.

You will have special spots for your fat. The best way to fix this is to take a nail, say a three inch nail, cut the head off thus making a point at both ends, drive one end into the tree or the place where the fat is to be put, leaving the longer portion sticking out and sloping upward. The fat can easily be shoved on to this spike which will remain permanently in position.

To tame birds it is necessary to proceed by slow degrees. The birds must first become familiar with the general surroundings, and then they can be gradually brought to the window by getting them acquainted with a special feeding dish, and placing this a little nearer the window each day. After they have become accustomed to the window sill they can be tamed to feed from the hand by proceeding in the same slow, progressive way. If we are to keep the birds continually about we must have some feeding devices which will keep a supply of food always accessible.

A seed or grain hopper surrounded by a covered tray is a device which should be at every feeding station.

Mr. W. Saunders' upside-down feeding slab is contrived to protect the food from snow and rain. I have made one by fastening cork bark to a piece of board, this bark being very rough is especially adapable for the purpose.

The fat is slightly warm and is then pressed into all the holes and crevices of the bark. This slab is much used by Chickadees, Nuthatches and Woodpeckers, and is indispensible in rough weather.

An exceedingly useful addition to our outfit is a variant of Mr. Saunders' upside-down feeding slab; this is made by adding sides about one inch deep to the plain board. This when filled with melted fat, and nuts, if desired, provides a large bulk of food.

The wired dish is a new idea which has been tested only this winter. It is the invenion of Mrs. J. S. Berry, and her experience, which tallies with my own, is that the Chicadees enter it with perfect fearlessness.

The chief point in this dish is that the meshes formed by the crossing wires will admit a Chicadee but are too small to admit a Sparrow.

The bird curate is the most satisfactory of all our feeding appliances, for the reason that it affords such ample accommodation. It is no uncommon thing to have twelve to fifteen birds feeding at once on the different sections. To secure this it is of course necessary to use finely powdered food, which requires that the bird stay on the spot in order to get a meal. This accustoms them to our person and our movements and has a great influence in taming them.

The feeding log is another of Mr. Saunders' inventions, the essential principle of which is that it shall hang by string or wire so that it oscillates with the breeze or the motion of the birds. Sparrows have a decided objection to feeding from a moving object, and until they cure themselves of this idiosyncrasy we can take advantage of it to avoid having them steal the expensive food that we provide for our native friends. There remains the additional advantage that we can use these sparrow-proof devices further down in the garden, until such time as the Sparrows decide to assist in the destruction of the food thus provided.

Have a feeding station. The birds will repay your kindness with their friendly confidence. Making friends with the birds brings us closer to the great world of nature about us, which is so full of wonderful blessings.



PUFFINS ON LEDGE OF BONAVENTURE ISLAND (Not Razor-billed Auks).
Photo by Geological Survey—Courtesy of Commission of Conservation, Canada.

NOTES ON THE SUMMER BIRDS OF THE GASPE PENINSULA.

By CHARLES W. TOWNSEND, M.D., BOSTON.

(Continued from Vol. XXXIV, page 80.)

The adults on alighting near their half grown young empty their stomach contents on the ground and the young eagerly swallow it. The young may often be seen practicing short flights on the top of the Rock, but when they once launch out from their nesting place they roost on the broken rock and beaches at the foot of the cliffs.

9. *Larus philadelphia.* Bonaparte's Gull.
On August 14th I saw two adults and four immature birds of this species in the Gaspé Basin, evidently migrants.

10. *Sterna hirundo.* Common Tern.
The only birds of this species I saw anywhere along the coast of the Peninsula were about a dozen at Cross Point on July 5th. Mr. Taverner does not note them.

11. *Hydrochelidon nigra surinamensis.* Black Tern.
One seen August 27th in the lower part of the York River near Gaspé.

12. *Oceanodroma leucorhoa.* Leach's Petrel.
Breeding commonly in the clefts and holes in the top of the Gannet cliffs at Bonaventure Island.

13. *Sula bassana.* Gannet.
As already stated about 8,000 Gannets breed in the cliffs on the eastern side of Bonaventure Island. The great majority of the birds seen were in full adult plumage; about one in three or four hundred had black in the base of the wing, in the tail and scattered over the back. These, I suppose, are birds two years old.

Early in July nearly all the eggs had hatched, but I watched an adult on July 18th which was brooding an egg in the nest. When the bird raised itself I saw that one webbed foot nearly covered the egg. This singular habit has been noted in literature.

From time to time adults could be seen bringing rockweed in their bills and patching up their nests. The nests like the ledges were painted white with the droppings of the birds. The white downy young with black faces grew rapidly between the time of my first visit on July 10th and my last on August 3rd when they were nearly half as large as their parents.

The curious courtship ritual I have described at length in my paper on Courtship in Birds[5]. This always takes place when a bird arrives at the nest to relieve its mate. It is evident that the sexes alternate in feeding and brooding the young. The new arrival at the nest, after its mate has left, waddles around so that the young is in front of her breast. The young at once raises its black head and shows by its vibrating throat that it is calling for food. The parent often appears indifferent, preens her own feathers and the down of her offspring, gapes sleepily and darts her head angrily at a neighbor. The young become more insistent and tries to wedge open the bill of its mother. She at last gives a gulp, curves her head down, opens wide her bill and appears to swallow the head and neck of her hopeful. The process is soon repeated; the young always seem ready to disappear into the cavern of its parent's mouth.

Whether the great volume of noise that goes out from this ledge is the courtship song or not I can not say, but it is doubtless augmented by the calling of the young for food. It suggests thousands of rattling looms in a great factory, a rough vibrating pulsing sound, and may be written down *car-ra, car-ra, car-ra.*

Taking advantage of the strong sea breezes and of the currents deflected upwards by the cliffs, the Gannet is able to soar on rigidly outstretched wings for a long time without flapping. One,which I watched passing within a few yards of me, circled ten times to within a few feet of a ledge crowded with its kind, and each time he dropped his feet as if about to alight, but each time drew them up again and sailed by. Except for a momentary flutter just before each attempt to alight, his wings were held rigidly outstretched. The circle was one of three or four hundred yards in diameter. On each of the last three times he executed a smaller circle in addition, thus completing a figure of eight. On the eleventh attempt he dropped suddenly on the ledge close to his mate on her nest. The bill-shaking and bowing and caressing that went on was in the most spontaneous and eager fashion. They appeared over-joyed to meet again.

Before flying from the ledge the Gannet generally poises motionless for several moments with its eyes and bill pointed upwards, perhaps in order to watch for an opportunity to fly without colliding with another bird in the air. It then leaps clear of its companions and of the ledge, and with tail turned down as a brake, it swiftly descends until it gathers impetus enough to rise.

At Grand Grève in the early part of August I frequently saw Gannets singly or in groups of two

and threes fly back and forth in Gaspé Bay. During the latter part of the month they were flying south. I did not see any fly over the land.

14. *Phalacrocorax auritus auritus.* Double-crested Cormorant.

A very abundant bird all along the coast. It breeds to the number of about 2,000 on top of Percé Rock and in large numbers on the great sea cliffs at Bon Ami and at the foot of Mt. St. Albans.



GENERAL VIEW OF GANNET LEDGES, BONAVENTURE ISLAND, 1914.
Photo by Geological Survey of Canada —Courtesy of
Commission of Conservation, Canada.

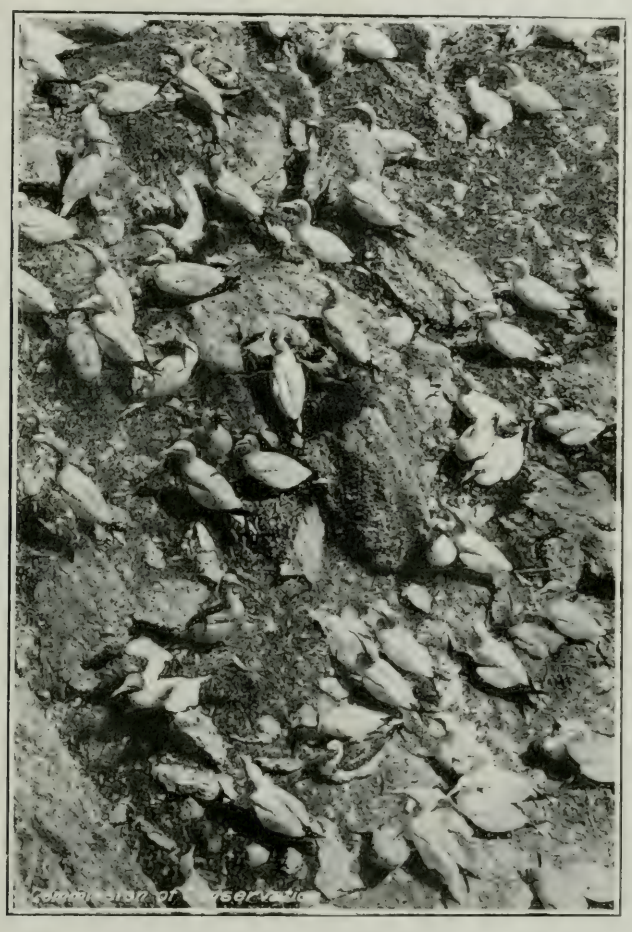
At Percé Rock there appeared to be seventeen distinct clusters of nests where everything including the nests was painted white with droppings and the ground was devoid of vegetation. Where the Herring Gulls nest the surface is largely covered with vegetation. Yarrow, *Achillea borealis*, appears to be the most abundant species and grows luxuriantly.

The feeding of the partly-grown and especially of the fully-grown young Cormorant was always an amusing spectacle. An adult alighting on the rock is at once besieged by one or more young who wave their wings frantically and raise their heads, beseeching the parent for food. Often times the parent is reluctant to acceed to the request and runs away, closely pursued by its offspring, dodging in and out among the other Cormorants and Gulls. Finally the parent gives in, opens its capacious maw into which the young disappears as far as its head and neck are concerned. The parent gradually lowers its head as the young pushes in, and finally bring it nearly to the ground. The young, meanwhile, flaps its wings violently, and the picture is of a large bird trying hard to swallow another bird of the same

size who struggles violently in protest. It frequently happens that, after repeated requests for food, the parent, unable to rid itself of the tormenting young, takes refuge in flight.

The young when fully grown may often be seen practicing flight by ascending a few feet into the air and coming back to the rock. The earliest descent by the young to the water took place the last of July.

that they stand out as light patches on the gray rock, while the birds themselves look like black bottles. During my stay at Grand Grève during the month of August an almost continuous stream of these birds was passing and repassing over the little settlement, the birds were going to their feeding grounds in the Gaspé Basin and York and Dartmouth Rivers and returning to their nests. They passed singly and in companies of two or three up



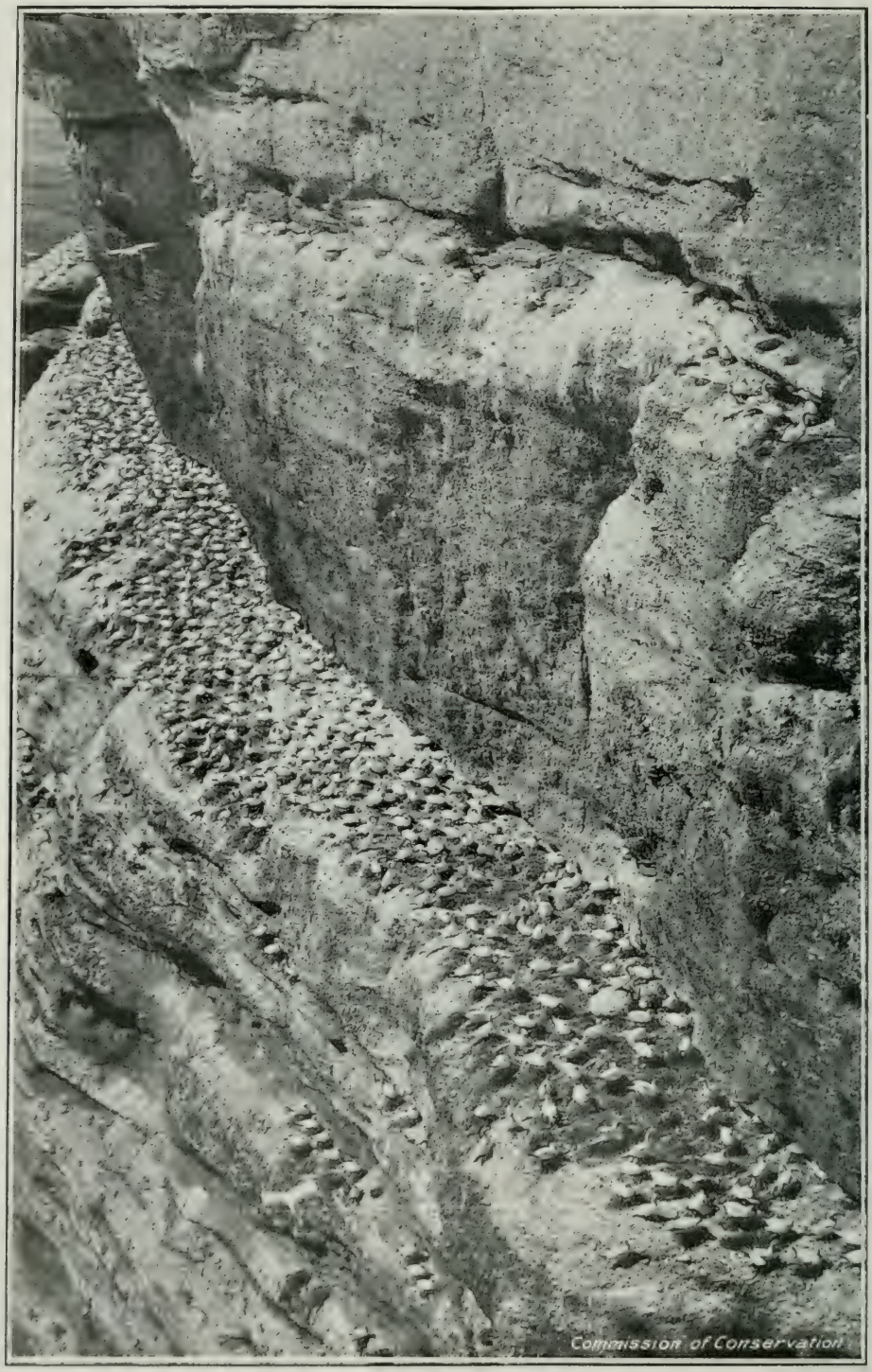
CLOSE-UP VIEW OF GANNETS ON LEDGES OF BONAVENTURE ISLAND, 1914.
Photo by Geological Survey—Courtesy of Commission of Conservation, Canada.

The great cliffs, which rise from the water to a height of six or seven hundred feet and extend along the shore for four or five miles near Mt. St. Albans and Cape Bon Ami on the north side of the Forillon back of Grande Grève are nearly perpendicular and possess but few shelves for foothold. On these are built the nests of this species and they are so plastered with the white guano of the bird

to thirty or forty. In warm weather most of the birds had their mouths open, but in cool weather they were shut. I looked carefully for *carbo* but all were *auritus*.

During August groups of a hundred or more fully grown young birds were to be seen on the little pocket beaches at the foot of the Bon Ami cliffs.

The fishermen dislike this bird as they say it



GREAT GANNET LEDGE, BONAVENTURE ISLAND, GASPE CO., QUE.
Photo by Geological Survey—Courtesy of Commission of Conservation, Canada.

takes herrings on which they depend for bait, from their nets. I saw no shooting, but on the York River there were steel traps on posts and a few birds had suffered a lingering death.

Mr. Taverner found two nesting colonies of this species in Gaspé Bay, one on Gull cliffs on the south side, the other on the north side at Three Runs. Here the nests, about thirty in number, were built in birch trees growing in crevices in the cliffs.

15. *Mergus serrator.* Red-breasted Merganser.
A flock of 20, seen at the mouth of the York River on August 27th.

16. *Anas rubripes tristis.* Black Duck.
A number seen in the Gaspé Basin and the mouth of the York River the latter part of August. Mr. Taverner found them there with young.

17. *Spatula clypeata.* Shoveller.
A bird probably of this species from the description given to Mr. Taverner, was shot at Cape Cove in June, 1915.

18. *Aix sponsa.* Wood Duck.
Mr. Taverner found a mounted specimen at Gaspé taken in the vicinity.

19. *Clangula clangula americana.* Golden-eye Duck.
Thirteen young with their mother were found on the upper Gaspé Basin by Mr. Taverner on July 29, 1914.

20. *Harelda hyemalis.* Old Squaw.
Small flocks were seen near Bonaventure Island in 1915 by Mr. Taverner. One was taken July 22nd.

21. *Histrionicus histrionicus.* Harlequin Duck.
In June and July, 1915, on three occasions bunches of three to seven were seen near Bonaventure Island by Mr. Taverner. Three were taken, all with undeveloped genitalia.

22. *Oidemia americana.* Scoter.

23. *Oidemia deglandi.* White-winged Scoter.

24. *Oidemia perspicillata.* Surf Scoter.
A few of each of these species, evidently migrants, were seen during the latter part of August.

25. *Botarus lentiginosus.* Bittern.
I saw two on the York River on August 27th.

26. *Ardea herodias herodias.* Great-blue Heron.
From the train on July 7th I saw numerous birds of this species in the tidal flats near Point au Garde. At Douglastown on August 21st I counted twenty-four behind the barachois. On the York River on August 27th there were eight.

27. *Nycticorax nycticorax naevius.* Black-crowned Night Heron.
Mr. Taverner and I each saw a single bird at Percé. He found it common at Gaspé.

28. *Gallinula galeata.* Florida Gallinule.
Mr. Taverner saw a mounted bird at Gaspé taken in the vicinity.

29. *Lobipes lobatus.* Northern Phalarope.
Mr. Brewster saw this species near Percé in July, 1881.

30. *Philohela minor.* Woodcock.
Mr. Brewster reported one near Gaspé in 1881, and Mr. Taverner heard of another shot there.

31. *Pisobia minutilla.* Least Sandpiper.
Common migrant.

32. *Ereunetes pusillus.* Semipalmated Sandpiper.
Only a very few seen.

33. *Calidris leucophaea.*
One was seen on August 21st at Douglastown. There are very few suitable grounds for shore birds on the Gaspé Coast.

34. *Totanus melanoleucus.* Greater-yellow legs.
A number seen back of the barachois at Douglastown and on the flats about the York River.

35. *Actitis macularius* . Spotted Sandpiper.
Common all along the shore. At Bonaventure Island a pair, evidently having eggs or young near our camp, flew about nervously and alighted from time to time in the tops of low spruce trees.

36. *Numenius hudsonicus.* Hudsonian Curlew.
A few migrants seen.

37. *Squatarola squatarola.* Black-bellied Plover.
On August 21st I saw two flocks of a dozen each feeding back of the barachois at Douglastown in the brackish marshes.

38. *Aegialitis semipalmata.* Semipalmated Plover.
A few migrants seen.

39. *Arenaria interpres morinella.* Ruddy Turnstone.
A few migrants recorded by Mr. Taverner.

40. *Bonasa umbellus togata.* Canada Ruffed Grouse.
A few with young seen near Percé.

41. *Circus hudsonius.* Marsh Hawk.
One seen at Bonaventure Island and several on the Forillon.

42. *Accipter velox.* Sharp-shinned Hawk.
A few seen near Grande Grève.

43. *Buteo borealis borealis.* Red-tailed Hawk.
During the latter part of August there was a small southward migration of these hawks.

44. *Buteo platypterus.* Broad-winged Hawk.
I clearly identified one of these at Grande Grève on August 24th, and saw the same one or another there the following day.

45. *Archibuteo lagopus sancti-johannis.* Rough-legged Hawk.
One seen at Grande Grève on August 19.

46. *Haliaeetus leucocephalus alascanus.* Northern Bald Eagle.
Four of these birds in immature plumage were flying about a rocky crag in the woods of Cross Point on July 7th.

47. *Falco peregrinus anatum.* Duck Hawk.
A pair of these birds evidently nested near the Pic d'Aurore at Percé.

48. *Falco columbarius columbarius.* Pigeon Hawk.
One seen at Cannes des Roches,—one near Percé and two or three near Grande Grève.

49. *Falco sparverius.* Sparrow Hawk.
One seen from the train near Nouvelle on August 28.

50. *Pandion haliaetus carolinensis.* Osprey.
A few all along the coast. Between Grande Grève and Gaspé I counted six, and six in a day's trip on the York River.

51. *Ceryle alcyon.* Belted Kingfisher.
A few seen along the coast.

52. *Dryobates pubescens* sub. sp. Downy Woodpecker.
A few seen. Mr. Taverner secured a single specimen at Gaspé. Its measurements are,—wing 96; tail 62; culmen 16; tarsus 15.

53. *Sphyrapicus varius varius.* Yellow-bellied Sapsucker.
One seen at Cross Point and their markings on trees seen elsewhere.

54. *Colaptes auratus luteus.* Northern Flicker.
Not uncommon at all stations.

55. *Chordeiles virginianus virginianus.* Nighthawk.
One seen at Cross Point by me and a few at Gaspé by Mr. Taverner.

56. *Chaetura pelagica.* Chimney Swift.
One seen at Cascapedia and Mr. Taverner reported a pair at Percé in 1915.

57. *Archilochus colubris.* Ruby-throated Hummingbird.
Mr. Taverner saw one at Percé in 1915. I saw one at Corner of the Beach and another at Grande Grève.

58. *Tyrannus tyrannus.* Kingbird.
One was noted by Mr. Taverner at Percé on June 10, 1915.

59. *Empidonax flaviventris.* Yellow-bellied Flycatcher.
Not uncommon.

60. *Empidonax trailli alnorum.* Alder Flycatcher.
A few seen and heard in song at Percé.

61. *Cyanocitta cristata cristata.* Blue Jay.
One was noted at Percé by Mr. Taverner on July 4th, 1914 and July 28, 1915, and one was seen by Judge C. F. Jenny in 1911 at Percé.

62. *Persisoreus canadensis canadensis.* Canada Jay.
One seen at Bonaventure Island on July 9th, 1914 by Mr. Taverner.

63. *Corvus corax principalis.* Northern Raven.
At least one pair at Percé and another at Grande Gréve. A family were always to be seen about the cliffs at the Grande Coupe at Percé and the birds flew back and forth to the cliffs of the Murailles and Pic d'Aurore. Here they were continually set upon by Herring Gulls. The cause of the animosity on the part of the latter bird was evident, for Mr. Taverner records that a Raven was seen on the cliffs of Grande Coupe in 1915 feeding its offspring with a young Herring Gull.
The flight of the Ravens about Pic d'Aurore was extremely graceful. In the strong sea breeze they often rose from near the sea to the summit of the peak, 700 ft. without apparent movement of the wings.

64. *Corvus brachyrhynchos brachyrhynchos.* Crow.
Common everywhere and as tame and easily approached as I have found them at Cape Breton. At Percé I saw two Crows feeding in a field of young barley within thirty yards of a realistic scare-crow. They were often seen on fence posts and out-buildings and they often fed on the fish heads, and entrails spread on the land as fertilizer. At Barachois on July 26th I saw about a hundred crows on the beach near the fish-splitting tables and alighting on the fishing boats. Here they took the part of the Herring Gulls at Percé and elsewhere.

65. *Molothrus ater ater.* Cowbird.
One in immature plumage was seen at King George Cove near Grande Grève on August 25th.

66. *Sturnella magna magna.* Meadowlark.
One was reported by Mr. Taverner as seen at Percé about June 10, 1915.

67. *Quiscalus quiscula aeneus.* Bronzed Grackle.
I am inclined to think this is a recent arrival in the Gaspé Peninsula. I was told both at Percé and Grande Grève that these birds had been seen in the last few years only. In 1914, Mr. Taverner saw a few at Gaspé but none at Percé. In 1915 he saw a few evidently nest-

ing just to the south of Percé. In 1919 I found a dozen or more spending the summer in Percé also at Grande Grève, and I saw a flock of 50 or 60 near the marshes of the York River. I was told that they had become a great pest at Grande Grève as a flock would descend on a newly planted grain field and root up the grain.

68. *Pinicola enucleator leucura.* Pine Grosbeak.
On July 16, 1915, Mr. Taverner gives a doubtful record of this bird. I saw single birds several times at Percé and Grande Grève.

69. *Carpodacus purpureus purpureus.* Purple Finch.
Common, breeding.

70. *Loxia curvirostra minor.* Crossbill.
A flock of a dozen seen near Percé on July 30.

71. *Loxia leucoptera.* White-winged Crossbill.
On June 26th, 1914, Mr. Taverner saw a large flock of these birds near Percé and secured one. Later a flock of 100 to 150 were continually moving about. I saw only one, an adult, at Percé on July 9th.

72. *Astragalinus tristis tristis.* Goldfinch.
Abundant everywhere. If the species depends here on thistle-down for nest construction it must needs wait until the end of August.

73. *Spinus pinus.* Pine Siskin.
The most abundant passerine bird. Seen everywhere in flocks during July and August. Mr. Taverner found a nest and eggs on July 21st, 1915.

74. *Passerculus sandwichensis savanna.* Savannah Sparrow.
Very common breeder in open fields everywhere.

75. *Zonotrichia leucophrys leucophrys.* White-crowned Sparrow.
One was seen by Mr. Taverner at Percé on June 21st, 1914, evidently a late migrant towards the north. This is the only record.

76. *Zonotrichia albicollis.* White-throated Sparrow.
Abundant breeder everywhere.

77. *Spizella passerina passerina.* Chipping Sparrow.
Common at both Percé and Grande Grève. Feeding young at latter place on August 7th.

78. *Junco hyemalis hyemalis.* Slate-coloured Junco.
Very common breeder.

79. *Melospiza melodia melodia.* Song Sparrow.
Common breeder both at Percé and Grande Grève.

80. *Melospiza lincolni lincolni.* Lincoln's Sparrow.
Mr. Taverner shot a bird of this species at Gaspé on July 28th, 1914, but has no other record of it. I had found the bird in crossing New Brunswick on my way to the Gaspé Peninsula but although I looked for it everywhere there I did not find it.

81. *Passerella iliaca iliaca.* Fox Sparrow.
Mr. Taverner has only one doubtful record of this bird at Percé. Messrs. R. B. Mackintosh and A. A. Osborne saw one there on July 14, 1915. I saw the bird not uncommonly at Percé and heard it singing through July and as late as August 1st. There were at least three pairs at Bonaventure Island. I did not find it at Grande Grève, but the song season was then over.

82. *Petrochelidon lunifrons lunifrons.* Cliff Swallow.
This was the common Swallow, nesting everywhere under the eaves of buildings.

83. *Hirundo erythrogastra.* Barn Swallow.
A few seen both by Mr. Taverner and me. I did not see any until August 3rd, evidently migrants.

84. *Iridoprocne bicolor.* Tree Swallow.
I saw two or three at Cross Point and at Gaspé. Mr. Taverner saw a few.

85. *Riparia riparia.* Bank Swallow.
A very few of this species were seen and those not till late in the season.

86. *Bombycilla cedrorum.* Cedar Waxwing.
A few were seen by Mr. Taverner in Percé in 1914.

87. *Lanius borealis.* Northern Shrike.
On August 18 I saw one of this species at Grande Grève.

88. *Vireosylva olivacea.* Red-eyed Vireo.
I found a few of these birds at Cross Point and at Percé. Mr. Taverner took a specimen at Percé.

89. *Vireosylva philadelphica.* Philadelphia Vireo.
At Percé on July 14th I had a momentary view of a bird that I believed to be of this species and I determined to follow up any vireo I heard singing. On July 21st in the gorge of the Grande Chute near Percé I heard a song resembling that of the Red-eyed, but not so continuous, the phrases were more distinct. I succeeded in seeing the bird within about fifteen yards and discovered that it was a Philadelphia Vireo.

90. *Lanivereo solitarius solitarius.* Blue-headed Vireo.
One heard singing at Cross Point on July 5th, and one seen at Grande Grève on August 20th.



PERCE ROCK, QUE.
Courtesy of the American Museum of Natural History.



PERCE VILLAGE, QUE., WITH PERCE ROCK AND BONAVENTURE ISLAND IN THE DISTANCE.
Courtesy of the American Museum of Natural History.

91. *Mniotilta varia.* Black and White Warbler.
Two were seen at Cross Point.

92. *Vermivora peregrina.* Tennessee Warbler.
A very common bird at both Cross Point and Percé and in full song. Mr. Taverner took several nests.

93. *Compsothlypis americana usneae.* Northern Parula Warbler.
One observed at Cross Point.

94. *Dendroica tigrina.* Cape May Warbler.
A few were seen by Mr. Taverner in 1914 and 1915. I saw one at Percé on August 2nd.

95. *Dendroica aestiva aestiva.* Yellow Warbler.
One was seen at Percé on July 14, 1915 by Mr. Mackintosh. I saw several at Cross Point and two or three at Percé. Mr. Taverner observed two at Gaspé.

96. *Dendroica caerulescens caerulescens.* Black-throated Blue Warbler. The only record is of one bird seen by me at Grande Grève on August 16th.

97. *Dendroica coronata.* Myrtle Warbler.
A rather common breeder.

98. *Dendroica magnolia.* Magnolia Warbler.
A very common bird everywhere.

99. *Dendroica castanea.* Bay-breasted Warbler.
Not uncommon.

100. *Dendroica striata.* Black-poll Warbler.
Abundant. Mr. Taverner found nests.

101. *Dendroica fusca.* Blackburnian Warbler.
A few were seen.

102. *Dendroica virens.* Black-throated Green Warbler.
Common.

103. *Dendroica palmarum hypochrysea.* Yellow Palm Warbler.
One was seen at Percé on June 10, 1915 by Mr. Taverner.

104. *Seiurus aurocapillus.* Oven-bird.
I found this bird not uncommon at Cross Point but did not see it elsewhere. Mr. Taverner did not observe it.

105. *Seiurus noveboracensis noveboracensis.* Water Thrush.
I found one of these in full song at Cross Point on July 5th and on August 17th and 19th saw one at Grande Grève.

106. *Oporornis philadelphia.* Mourning Warbler.
I saw one at Cross Point on July 5th.

107. *Geothlypis trichas trichas.* Maryland Yellow-throat.
I found a few of this species at Cross Point, but none elsewhere. Mr. Taverner does not record it.

108. *Wilsonia pusilla pusilla.* Wilson's Warbler.
Mr. Taverner does not record it in 1914 but in 1915 says "Not uncommon and seen in occasional individuals throughout our stay. Undoubtedly breeds." I saw none.

109. *Setophaga ruticilla.* Redstart.
Not uncommon.

110. *Nannas hiemalis hiemalis.* Winter Wren.
Not uncommon.

111. *Certhia familiarus americana.* Brown Creeper.
One seen at Grande Grève on August 8th.

112. *Sitta canadensis.* Red-breasted Nuthatch.
Not uncommon after August 6th at Grande Grève. The earliest seen by Mr. Taverner was July 29th.

113. *Penthestes atricapillus atricapillus.* Chicadee.
I saw two or three at Cross Point and also at Grande Grève.

114. *Penthestes hudsonicus littoralis.* Acadian Chicadee.
Not uncommon at Percé and at Grande Grève. Mr. Taverner secured four specimens. They belong to this subspecies. He also saw nestlings fed by parents.

115. *Regulus satrapa satrapa.* Golden-crowned Kinglet.
A few seen at Gaspé during August. Mr. Taverner found nestlings fed by parents.

116. *Regulus calendula calendula.* Ruby-crowned Kinglet.
One was seen at Grande Gréve on August 16th. Mr. Taverner reports a flock of about ten of this species on July 24th, 1914, at Gaspé.

117. *Hylocichla fuscescens fuscescens.* Veery.
I heard three singing at Cross Point on July 5th.

118. *Hylocichla aliciae aliciae.* Gray-cheeked Thrush.
Mr. Taverner took one of this species on July 16th, 1914, at Percé. I saw one at Percé on July 13th, and heard its calls answered by another.

119. *Hylocichla ustulata swainsoni.* Olive-backed Thrush.
Common everywhere and singing until the middle of July.

120. *Hylocichla guttata pallasi.* Hermit Thrush.
A few at Cross Point and Percé.

121. *Planesticus migratorius migratorius.* Robin.
Common everywhere.

THE DIVING HABIT AND COMMUNITY SPIRIT OF THE SPOTTED SANDPIPER.

BY H. MOUSLEY, HATLEY, QUE.

In the "Ottawa Naturalist," for September, 1918, page 56, Mr. John D. Tothill gives an instance whilst out canoeing on the Restigouche River, of the diving of this small Sandpiper to avoid pursuit by a hungry Pigeon Hawk *(Falco columbarius)* and speaks of the behaviour as being unusual. I remember being equally surprised on first witnessing this habit some few years ago at Hatley. On that occasion I had shot an immature bird which fell at the edge of the water, but on proceeding to the spot to pick it up as I thought, was surprised to see it wade out into the water, where after getting out of its depth it sank to the bottom, and by means of its wings and feet proceeded to travel at a great rate under the water to a small mud bank, where it came to the surface and hid in the surrounding rushes. (See "The Auk," Vol. xxxiii, 1916, p. 66.)

That this wading, swimming and diving habit is by no means so unusual as most people imagine, seems to be borne out by the experience of others, for Dr. Warren notes that a young bird when wounded took to the water in a shallow stream, went to the bottom like a stone, ran across on the botton, and coming up on the other side endeavoured to conceal itself by submerging its body and pushing its head among long grass growing at the water's edge. In September, 1876, Mr. E. H. Forbush saw a wounded bird of this species when pursued, dive into deep water from the shore of the Charles River and fly off under water, using its wings somewhat as a bird would use them in the air. All its plumage was covered with bubbles of air, which caught the light until the bird appeared as if studded with sparkling gems as it sped away into the depths of the dark river. (See "Game Birds, Wild Fowl and Shore Birds," Forbush, 1912, p. 323, where Dr. Warren's experience is also recorded). Dr. Charles W. Townsend remarks in his "Birds of Essex County," 1905, p. 188, that the young birds, while still covered with natal down, run very fast and when hard pressed, take to the water and swim rapidly and easily.

Regarding the community spirit of this restless little Sandpiper, the same author speaks of its being particularly fond of nesting on islands, and that in the late seventies he used to find the eggs at Kettle Island off Magnolia, whilst Mr. W. A. Jeffries found eleven nests with eggs, and one with young at Tinker's Island, off Marblehead, on June 8, 1878. Four nests were in the short grass on high land, while the others were all found more or less far under the rocks scattered over the grass or along the shore.

Nuttall in his "Manual of the Ornithology of the United States and Canada," 1834, Vol. 2, p. 164, speaks of their nesting at Egg Rock off Nahant, in the immediate vicinity of the noisy nurseries of the quailing Terns. Mr. Julian K. Potter, writing in "Bird Lore," Vol. xx, 1918, No. 4, pp. 282-284, says, "That the Spotted Sandpiper sometimes associates with others of its kind, and may be found breeding in a restricted area, is an established fact, but I believe, however, that this habit is the exception rather than the rule with these birds." He then goes on to relate how at the end of May, 1913, he found Spotted Sandpipers nesting in colonies within the city limits of Camden, N.J., as well as in the wilds of Pike County, Pa. In the former place six nests were found within an area of one forth acre, whilst in the latter about twelve pairs (three nests were actually found) were thought to be breeding in quite a limited area.

As regards my own experience at Hatley, I have already recorded in "The Auk," that usually not less than six pairs used to nest on the margins of 'the marsh' some fifteen acres in extent, but of late years the numbers seem to have decreased. The most extraordinary case, however, of this community spirit and partiality for nesting on small islands is related by Mr. L. M. Terrill in his paper on "The changes in the status of certain birds in the vicinity of Montreal," "Ottawa Naturalist," Vol. xxx, 1911, p. 57, wherein he says, "Having seen no mention of gregarious habits attributed to this Sandpiper, it might be of interest to note that a few years ago a large colony were nesting on Isle Ronde (a small island of a few acres, opposite the city). Visiting this island on May 26, 1896, I located without difficulty thirteen occupied nests. Again on May 31, 1898, I examined upwards of twenty-five. On each occasion only a small portion of the island was examined and I estimated that there were well over one hundred pairs breeding."

In striking contrast to this might be mentioned my experience with the Common Sandpiper of Europe *(Tringa hypolenca)* first cousin to our Spotted species, and a bird very like it not only in appearance but in general habits also. In the British Isles on the rivers Wharfe in Yorkshire, the Wye, Hamps, Manifold and Dove (the latter immortalized by Isaac Walton and Charles Cotton, the latter of whom calls her the "Princess of Rivers") all in Derbyshire, I have had ample opportunities of observing that instead of a community spirit existing the opposite seems to be the case, for there each pair of birds selects and monopolizes a certain

stretch of river, upon which no other pair appears to intrude. In conclusion it can truly be said that of the very intimate home life and traits of even our must common birds we know very little, and I have yet to see the text book that gives any definite information on the exact incubation period of the Spotted Sandpiper, which in the case of its cousin *(Tringa hypolenca)* has only lately been ascertained to be twenty one days. See "British Birds," 1913, Vol. vii, p. 146.

WINTER BIRD LIST FROM LONDON, ONTARIO.

(SUBMITTED BY THE MCILWRAITH ORNITHOLOGICAL CLUB, THROUGH MR. E. M. S. DALE.)

Have other localities been as favored with birds as was London last winter? From January 1 to February 8, forty-one species were reported which is about twice the normal number.

As is the usual practice of our club members we took the 7.40 train to Hyde Park on New Year's morning and walked back to the city, a distance of probably six or seven miles, following roughly the course of the River Thames. We made a list of twenty-two species, and on the following Saturday, January 3, visiting practically the same district, made another list of eighteen, which included six not seen on New Year's Day. Since then "one at a time" has been the usual rule until we now have a total of forty-one as above mentioned. December was quite cold and snowy, and January decidedly so, the thermometer registering zero and below on many occasions, and a snowfall of upwards of two and one-half feet being registered for the month. The list in order of date is as follows:—

January 1. Brown Creeper, White-breasted Nuthatch, Red-breasted Nuthatch, Bluejay, American Crossbill, White-winged Crossbill, Black-capped Chicadee, American Goldeneye, American Merganser, Snowbird, Rusty Blackbird, Red-winged Blackbird, Song Sparrow, Downy Woodpecker, Pine Siskin, Junco, Golden-crowned Kinglet, Cardinal, Crow, Purple Finch, Tree Sparrow, White-throated Sparrow.

January 3. Hairy Woodpecker, Black Duck, Redpoll, Goldfinch, Northern Shrike, Kingfisher.

January 4. Hudsonian Chicadee.

January 5. Robin, Evening Grosbeak, Long-eared Owl.

January 11. Bronzed Grackle.
January 12. Sharp-shinned Hawk.
January 16. Coopers Hawk.
January 21. Screech Owl.
January 22. Yellow-bellied Sapsucker.
February 1. Ruffed Grouse.
February 6. Pine Grosbeak.
February 7. Herring Gull.
February 8. Red-shouldered Hawk.

The following notes on some of the species may be of interest.

American Crossbill.—Two rosy ones feeding quite low in a hemlock tree. Others have been seen seen since in Norway spruces.

White-winged Crossbill.—The flock of twelve or fifteen seen on New Year's Day were in a hemlock which seems to be the favorite food of these birds here. There were several rosy ones in the lot. White wings have not been reported since that date.

Cardinal.—Previous to 1910, Cardinals were of accidental or very casual occurrence here. Since that date they have been gradually increasing in numbers and are now fairly common. One winter one of our members had six or seven feeding at his place. They are a very welcome addition to our bird population.

Siskin.—Pine Siskins were unusually abundant this fall, and since winter set in an occasional flock of two have been seen.

Rusty Blackbird.—This and the Redwing have been keeping each other company at a point where a little stream (which looks and smells like sewage) enters the river. It is our first winter Rusty although Redwings have been recorded twice before.

White-throated Sparrow.—White-throats have stayed with us occasionally in winter, but this bird is living right in the heart of the city, being fed by friends and using a Norway spruce hedge for shelter. During December and early January it sang with spring time vigor, and would answer readily to a whistled imitation of its song.

Redpoll.—Redpolls are quite common this winter, hardly a trip being taken to the country when they were not recorded. They have been feeding almost exclusively on birch trees.

Hudsonian Chicadee.—Two specimens were taken by a collector near London, and at least two more have visited the food shelves of members of our Bird Club in different parts of the city.

Evening Grosbeak.—First reported by Mr. A. Wood near Coldstream, on January 5th. Since then a flock of some twenty-five have been seen by different parties in and near the city, as well as smaller flocks which may be part of the twenty-five.

Black Duck.—An unusual winter duck for us. Has been seen several times in the same locality.

Yellow-bellied Sapsucker.—First winter recorded.

NOTES AND OBSERVATIONS.

A 1919 CHRISTMAS CENSUS FOR TORONTO AND OTTAWA.—The Bird-Lore Christmas Census is well known. With a view to adding two more Canadian localities to the 1919 census, an excursion was made at Toronto on December 24th, and one at Ottawa, on December 26th.

Unfortunately the lists were submitted too late to be included in Bird-Lore, but as they give an idea of the bird population of the two places at almost the same time, they may be of interest.

Toronto, Ontario, route from High Park to Grenadier Pond, along shore of Lake Ontario to Humber Valley, up river and return by Bloor Street; December 24th; 1 p.m. to 4.30 p.m.; 5 inches snow; snowfall 1.5 inches; wind north-west 25 to 21 miles per hour; temperature 18.5 to 14.7 degrees F.; about 8 miles on foot; observers together.

Herring Gull 7, Loon 2, Chicadee 11, Hairy Woodpecker 1, (perhaps 2) Horned Grebe (?) 1, American Meganser 1, Black-backed Gull 1, Duck (?) 1, Scaup Duck 1, Song Sparrow 2, Tree Sparrow 1, Crossbill (?) 1, Redpoll 1. Total species about 13; individuals about 31.

Observers: Stuart L. Thompson and Hoyes Lloyd.

Ottawa, Ontario, to Hull, Quebec, Fairy Lake and return; December 26th; 12.45 p.m. to 4.45 p.m.; wind south-east; average velocity 10 miles per hour; temperature 15 degrees F.; about 5 miles on foot; observers together.

Chicadees 3, Pine Siskin 58, Ruffed Grouse 2, Redpoll 7, Pine Grosbeak 15; Total species 5, individuals 85.

Observers: H. I. Smith, L. D. Burling, and Hoyes Lloyd.

Such lists become of value in proportion to the number of them from all parts of the country and conclusions upon isolated lists must of course be made with caution.

The greatest number of species recorded from Toronto is due to the presence of various waterfowl, some of which may almost always be found on Lake Ontario. The Grebe and the Merganser were seen close under the shore ice, where they seemed to be endeavouring to escape the strong off shore wind and driving snow. The Loons were found just outside the mouth of the Humber River, which was frozen over.

Perhaps the Black-backed Gull should be questioned. However, it appeared large in comparison with the Herring Gulls and the mantle was very dark.

There is no doubt about the Song Sparrow. They were in their favorite winter haunt, a Cattail marsh. On the two other occasions when I have noted these birds at Toronto in winter they were found in the shelter of marsh vegetation.

The Ottawa list has fewer species; consisting strictly of winter birds; although weather conditions made the day much more favourable for observation. The routes traversed at Toronto and Ottawa are comparable; but there was no body of open water at Ottawa.

The flocks of Siskins were the most striking feature. They were feeding upon the abundant crop of cedar seeds. The Pine Grosbeaks and Redpolls were the first noted by me at Ottawa last winter.

HOYES LLOYD.

TEACHING BIRD PROTECTION BY MOTION PICTURES.—The Dominion Parks Branch of the Department of the Interior in co-operation with the Exhibits and Publicity Bureau of the Department of Trade and Commerce and the Biological Division of the Geological Survey, is endeavouring to promote the interests of bird protection in Canada through the medium of the motion pictures.

In films depicting bird life, as in other films, the Canadian element has not been duly represented. Of course films showing Canadian birds on their wintering grounds are of great value, but it is also desirable to balance these, by showing on the screen, pictures which tell Canadians of the wealth and value of the bird life existing to-day in Canada.

To tell a person, not particularly interested, that so many million dollars worth of crops are destroyed by insects, and that birds serve to protect these crops from damage does not impress him as much as to actually show the birds devouring the insects. Similarly, a dry dissertation on the need for distant bird sanctuaries, does not create the interest that a motion picture makes, which clearly shows the wealth of game and other birds protected by that sanctuary.

A beginning was made by showing the Geological Survey film of the "Birds of Bonaventure Island" and "Jack Miner's Geese," at two of the important fall exhibitions. These films are not suitable for general distribution because they lack sufficient explanatory titles, and in consequence, can only be used with lectures.

"A Bird City" which shows the birds on the Dominion sanctuary at Johnson Lake, Saskatchewan, was taken by the Trade and Commerce Department in co-operation with the Dominion Parks Branch and has already been given wide publicity in Canada.

Another film which shows the wonderful results obtained by Mr. and Mrs. J. C. Middleton in the winter feeding of birds at London, Ontario, is completed and others are in contemplation.

There are a multitude of subjects to choose from in planning such pictures, but it is quite possible that the reader of this article knows of good material for Canadian bird pictures which has not been called to the attention of the Branch. If this should be the case valuable bird protection work can be done by acquainting the Dominion Parks Branch of any discoveries made of nesting grounds, feeding stations and the like, so that motion pictures may be taken where possible. HOYES LLOYD.

HUDSONIAN CHICADEE.—Several Hudsonian Chickadees spent last winter with us here in Red Deer, feeding with the common Black-capped ones and making themselves very much at home. I have fed the birds every winter for many years and while numbers of our common Chicadees, Hairy and Downy Woodpeckers and latterly Blue-jays, fed daily on the food provided for them. This is the first time the little Brownies have put in an appearance at our feeding place. A friend reported having seen one near here several years ago. Winter caught us early in October, and my attention was drawn to a new bird note, which on investigation, proved to be the Hudsonian Chicadee, and in a very short time they were feeding with the other birds within a few feet of a window where I observed them at close range. All the birds were tame, the Chicadees absurdly so—and would settle on my hands when putting out food for them. It was rather amusing to watch the Hudsonians "bossing" the Black-caps, the latter having to give way to the strangers at all times. During the very cold weather their only note was a drawling plaintive de-de-de, very unlike our common Black-cap's clear notes; but with warmer weather and bright sunshine they sing two different songs—one a lovely bubbling note with a canary-like quality to it and the other beyond my powers to describe. Several people came to see these birds, and Mr. F. C. Whitehouse, Dr. Henry George and Mr. C. H. Snell have identified them. We hope they will stay and nest with us. We have a lot of spruce trees here where they could spend most of their time.

Description: Head dark brown, darker on forehead and over eyes; small white spot on cheek; back grey, washed with brown; wings dark grey; tail very dark grey; throat black; breast greyish white; sides cinnamon. One bird, which I presume was an adult male, had the breast pure white and the other colours correspondingly richer.

(MRS.) ELSIE CASSELS, RED DEER, ALTA.

THE STARLING IN CANADA.—We all realize what a mistake it was to introduce the English or House Sparrow into America. However, even the lamentable results of naturalizing this alien was not a sufficiently awful example and the experiment had to be tried with other species. Most such introductions have been failures. The European Gold Finch survived in limited numbers for a while, but quickly died out. The success with other species, such as the Skylark was equally futile, except in the case of the Starling. It has suceeded and multiplied near New York and adjoining coastal localities and like most of such successful introductions we wish it had been otherwise. Whilst not promising to be such an arrant pest as the English Sparrow, its effect has not been good and, flocking to city parks, orchards and such semi-wild places, has still further displaced native species with whom we are in closer sympathy. It has shown all its bad habits and few redeeming good ones.

So far, in Canada, we have congratulated ourselves that our climate would prevent the intrusion of the Starling into our country and while we felt commiseration for our neighbors across the border we took little more than an academic interest in the matter. But it now looks as if our complacency was to be rudely shattered. The Starling has been reported from Canada.

Mrs. R. W. Leonard, of St. Catherines, Ont., writes that she saw a small flock about her place last winter. Further inquiries bring forth the following information from her in substantiation. The birds were observed at a distance of about twenty-five feet through field glasses and were identified by means of comparison with descriptions and plates in Chapman's Birds of Eastern North America, Reed's Bird Guide and the National Geographic Magazine. They are described as follows: "Their heads were dark and something like a blackbird's, the wings were a very dark shade of brown, speckled all over with light spots." This last detail seems to be conclusive and to quiet any doubts that might otherwise arise as to the identification.

There have not been any published reports of the birds occurrence anything like so far from the place of original introduction and it is surprising that they should have made this great jump in distribution without being reported from intermediate localities. Any other appearance of this species should be immediately reported that we may keep track of its spread and perhaps initiate methods of prevention.

P. A. TAVERNER.

HOW A YOUNG PUPPY AVOIDED STARVATION.—The Clearwater river, which enters the Athabasca at Fort McMurray, Alta., is from its mouth as far as Portage la Loche, a comparatively well-travelled canoe route. Several canoes at least will pass up and down its waters each month of navigation. This portion of the river was formerly an important link in the line of travel between the Churchill and Mackenzie river districts and is still largely travelled. Above Portage la Loche, however, the river is rarely used, the Swan lake Indians being practically the only travellers. These people inhabit the region about Swan lake at the headwaters of the river up in the granite area, and come down once a year to trade at Methye lake.

While on this upper portion of the Clearwater last summer, the writer came across an interesting example of how necessity can change the food habits of the domestic dog. On one of the portages at some little distance from the trail, a whining sound was heard, and on closer investigation a young puppy was discovered apparently not over three months old. In all probability he could not be found when the Indians moved their camp, as dogs in that country are too valuable to be voluntarily abandoned. Pathos was lent to the scene when he was discovered lying on a new Indian grave, which had been excavated laboriously by a wooden pick and shovel. These, as well as a motley array of ancient pails and cans, had been left on the grave, while nearby was a small bottle filled with water hung from a branch to ward off evil spirits. We afterwards learned that the Indians had left for their homes at Swan lake nearly two months before, and in all probability had been absent from the portage at least six weeks. The degree of slumping of the earth on the grave lent corroboration to this estimate. Apparently the puppy had lived on his own resources for that time. Considerable coaxing was required to gain his confidence so that he could be approached, but having done so, we were surprised to find that he was in much better condition than might have been expected. To one accustomed to seeing the gaunt, starving spectres of that country, which hang about the camps, stealing every possible scrap of food, the appearance of this little fellow, in an unhabited country, only a few weeks old, and whom one would not expect to know how to forage for himself, was quite remarkable. Upon closer investigation, it was found that he had changed his normal diet entirely, and, copying his cousin bruin, had become a berry eater. The country over which the portage passes is a burnt jackpine plain where blueberries and low bush cranberries grow in great profusion. These fruits the young dog was eating constantly, and he continued to do so, even after we had given him, as we thought ,a square meal of rice and meat scraps. Apparently he had become much addicted to his new diet. As he had made such a game struggle for existence, and as the autumn frosts would soon render his food supply precarious, we took him along until we reached the first Indian encampment on our return journey. Although well fed, whenever we landed, he would jump ashore and commence hunting for berries. One wonders why more dogs in that country do not take advantage of this kind of food, but such occurrences seem uncommon.

It may be added that kindness is as effective with the Indian's dog as with the most pampered poodle. The average dog of the north country, kicked, clubbed, and whipped from puppyhood, can scarcely be blamed for occasionally biting even the hand that attempts to pat or feed it. Although with us a very short time, this little dog was very affectionate and, as we paddled away, eluded the hands of the Indians to whom he had been given, jumped into the river and swam after us, and had to be returned forcibly to their keeping.

E. J. WHITTAKER.

Since mentioning the admirable work of Hamilton Laing in the Nature column of the *Toronto Globe*, (Can. Field Nat., xxxiii., p. 99). I have had my attention called to another similar writer in the *Daily Province*, Vancouver, B.C., J. W. Winson who under the nom-de-plume of "Wild-wood" contributes a series of articles entitled Open-air Jottings. These are a little more purely literary than those mentioned before but breath a wholesome out-of-doors spirit that is refreshing. They may not contain much information that is new to science but they present commonplace every day activities of wild and semi-wild things in an interesting light and must have a decided influence in educating the eyes of the indifferent to the wonders about them. It is to be regretted that the author does not boldly sign his own name. There is so much nature fakery that it is only due the public to let them know who they are listening to so they may judge authoritatively.

P. A. TAVERNER.

A SPIDER NEW TO CANADA.—At Lake Missanog, Frontenac Co., Ontario, on September 13th, 1919, I collected specimens of *Drapetisca socialis*, a little spider which runs about on the trunks of trees. Mr. J. H. Emerton, who kindly determined the specimens of this species, informs me that these are the first Canadian specimens he has seen.

A. BROOKER KLUGH.

THE CANADIAN FIELD-NATURALIST

VOL. XXXIV. OTTAWA, ONT., SEPTEMBER, 1920. No. 6.

AMONG THE COFFIN-CARRIERS.

By Harrison F. Lewis, Bergerville, P.Q.

Near at hand lay the nest-dotted green slopes of the island, stretches of rank grass alternating with thickets of raspberry and waving alder; farther back were the sparkling blue lake waters, with here and there flocks of great Gulls bedded upon them; and in the distance rose other islands, dark-green lumps, marked with numerous white spots proclaiming their winged inhabitants at home. The picture was most charming, but upon it the eye did not linger, for the centre of attraction was directly overhead, imperiously demanding attention. There, in the bright rays of the June sun, with the soft blue sky as a background, wheeled and circled, a hundred feet above me, a black and white cloud of six hundred Great Black-backed Gulls, the largest, the most magnificent, the most inspiring of our Sea-gulls. There was a scene which could not be duplicated!

Not in Labrador, not in Greenland were these Gulls gathered thus. The lake in which they make their home is bordered in part by farm lands, is within a mile or two of a railway, and within twelve miles of a town of seven thousand people. Although considered one of the wildest of Gulls, the Great Black-backed Gull *(Larus marinus)* or "Coffin-carrier" has established this colony, declared by Dr. C. W. Townsend to be "the largest breeding colony of this bird known, and the most southern one," in the midst of an accessible, agricultural country at Lake George, Yarmouth County, Nova Scotia.

Lake George is situated in the northwestern part of Yarmouth Country, in latitude 44° N., longitude 66° 2′ W., four miles from the Atlantic shore. It is four miles long and two miles wide, has a very irregular shore-line, and contains about a dozen islands, on seven of which, in the northern part of the lake, the Gulls nest. The greater part of its shore is wooded, but at no place are farm lands far distant, while for two or three miles they border directly upon the beach. The water-supply for the town of Yarmouth, twelve miles distant, is obtained from this lake.

I know of no generally recognized names for the islands occupied by the Gulls, but in order to make my records intelligible I have adopted for my own use names which are here given, together with sufficient information to render the islands identifiable. Big Gull Island is the largest island in the northern part of the lake, and has a larger number of nesting Gulls than has any other island. It is about a quarter of a mile long and half as wide, and rises some forty or fifty feet above the surrounding waters. The greater part of it is covered with alders and wild raspberry bushes, but there are some areas of open grassland, and a few spruce trees. Northern Gull Island lies north of Big Gull Island, to which it is similar, although smaller and with a larger wooded area. Bar Island is a low bar of rocks and gravel, of small extent, without trees or bushes. It lies south of Big Gull Island, and is elevated but one or two feet above the surface of the lake. Garnet Island lies southeast of Big Gull Island, near the eastern shore of the lake. It is small and narrow, and supports two or three living spruces and about a dozen dead ones. On its western side is a rather large area of coarse red sand, made up of small garnets. Catbrier Island, lying south of Garnet Island, is thickly wooded. A small thicket of Catbrier *(Smilax rotundifolia)*, which is uncommon in Nova Scotia, grows among its trees. Southern Gull Island is another small wooded island, lying south of Catbrier Island. Round Island is fairly well wooded, and is more nearly circular than are the other islands named. It is near the western side of the lake, at some distance from the remainder of the Gull colony.

My latest visit to this thriving colony was made on June 16, 1920, when I spent about six hours there and landed on each of the islands on which the Gulls nest, and made in each case a short, rough survey, walking over as much of each island as was practicable and noting numbers of nests, eggs, and young birds. As the greater part of the nesting area is covered with a dense growth of

trees, bushes, or ferns, no doubt many nests, probably about one-third of the total number present, escaped my eye. A much larger proportion of the young birds, perhaps four-fifths, must have been passed unseen by me. Not long after hatching, these young Gulls are able to leave the nest, and at the approach of danger, to hide in the abundant cover. The skill with which they do this, and the very large proportion which in consequence are passed unnoticed are well shown by my experience in July, 1914, when banding young Gulls on Big Gull Island. A careful search of the island at that time revealed but 19 young Gulls, of which I banded 16, all that were large enough for the purpose. I then went to another island, and was there long enough to allow resumption of normal life and a general moving about on the part of the young Gulls on Big Gull Island. Then I returned to Big Gull Island and searched it a second time, finding 21 young Gulls large enough for banding, but one of which was already banded. In other words, less than 7% of the first lot of young birds could be found in the second search, while more than 95% of the second lot escaped observation at the time of the first search.

In addition to counting exactly the young birds, nests, and eggs seen, I made careful estimates of the number of grown-up Gulls belonging to each island. This was very difficult because, when I visited an island, Gulls from other islands would fly over, in greater or less numbers, to join the actual residents of the island in protest. Nevertheless, I made repeated, careful estimates, with all the known conditions in view, and with the exercise of the strongest conservatism. A few Herring Gulls *(Larus argentatus)* are included in the colony, but they are almost lost in the clouds of Black-backs, in comparison with whose grandeur they, splendid birds though they are, seem small and very ordinary.



A QUIET DOZE—TWO LAKE GEORGE COFFIN-CARRIERS RESTING ON THEIR NESTING-ISLAND.

Photo by Howard H. Cleaves; reproduced by permission—Cut by courtesy of Dominion Parks Branch.

The results of my survey are shown in the accompanying table. The figures in the three columns at the right are estimates; all the other figures in the table are the results of actual counts. The term "adult" in this table refers to all birds hatched prior to 1920.

Island	Empty Nests	Nests with 1 egg	Nests with 2 eggs	Nests with 3 eggs	Total Nests	Total Eggs	Young	Dead Young	Dead Adults	Adult Herring Gulls (Estim.)	Adult G. B. b. Gulls (Estim.)	Total Adults (Estim.)
Round	5	1	—	—	6	1	4	—	—	15	—	15
So. Gull	5	3	2	—	10	7	18	—	—	—	25	25
Catbrier	1	—	—	—	1	—	2	—	—	10	—	10
Garnet	11	8	3	1	23	17	21	—	—	—	50	50
Bar	4	1	2	2	9	11	1	—	—	—	25	25
Big Gull	124	32	14	9	179	87	155	6	2	10	590	600
No. Gull	80	24	5	4	113	46	52	3	1	—	225	225
Total	230	69	26	16	341	169	253	9	3	35	915	950

A conservative estimate would, I believe, place the total number of grown-up birds in the colony in 1920 at not less than 1,250, made up of about 1,200 Great Black-backed Gulls and 50 Herring Gulls. These figures may be arrived at in either of two ways.

The total number of nests seen is 341; if this was two-thirds of the total number present, the colony contained 511 nests, which would mean 1,022 breeding birds. That there were enough non-breeding grown-up Gulls in the colony to bring the total up to 1,250 is not improbable.

Again, the number of grown-up birds seen at the colony by me was most conservatively estimated, as shown by the tabulated figures, at 915 Great Black-backed Gulls and 35 Herring Gulls. To suppose that at least 285 of the former species and 15 of the latter were away from the colony, hunting for food, at the time of my visit seems very reasonable. Not only were Gulls to be seen flying to the lake at 9.00 a.m., when I approached it, and at 6.00 p.m., when I finally left its vicinity, but Great Black-backed Gulls, presumably from this colony, may be found daily in summer at practically every point along the seacoast for sixty miles in either direction.

These estimates are the best which I have been able to prepare, but, if any one considers them in error in any way, the actual counts and facts stated above may, of course, form a basis for any estimate preferred.

When one approaches an island in the colony, the Gulls able to fly gradually leave it and, for the most part, circle overhead, although some alight on the water not far away. The air becomes filled with a pandemonium of deep cries, of which I was able to distinguish three kinds, a moderately loud *cuh-cuh-cuh, cuh-cuh-cuh,* a loud, bass *Ow, Ow,* and a roaring *rrr-rrr-rrr-rrr.* Most of the flying birds are in fully adult plumage, but some of them show traces of immaturity in brown markings here and there. By the time one lands on an island, all the Gulls able to fly have left it, and none of them return until the intruder has departed. As I walked over Big Gull Island, with fully six hundred Great Black-backed Gulls circling above me, I could not help thinking how little their fear was justified by the actual location of the power to harm. If those hundreds of tremendous birds had but realized their strength and willed to use it in effective coordination against the weaponless, shelterless human being intruding among their homes, they could with the greatest ease and speed have laid my bare skeleton to bleach upon the grass. But Great Black-backed Gulls are useful scavengers, naturally wild and shy, and I could not see that any of them at any time showed even especial solicitude for the particular nests or young near which I might be.

At the time of my visit, June 16, most of the young were recently hatched, but others were in the act of hatching. The newly-hatched young of the Great Black-backed Gull is a wet, spine-covered, ugly-looking dark object, sprawling helplessly, and uttering repeatedly a short, shrill whine. Soon, however, its spines burst into gray and black down, it gains the ability to walk and run about, and its cry changes to a rattling *eh-eh-eh.* The majority of the young which I saw on June 16 were in the downy stage. A small number showed feathers of the juvenal plumage in the wings and at the sides of the breast, and a very few of the

largest also had feathers of this plumage all across the breast and in the tail. Most of the young which are old enough to do so hide among ferns, bushes, grass, or rocks when the old birds leave an island at the approach of an intruder, but a few enter the water and swim rapidly away for a little distance. They are good swimmers, but can be overtaken easily by a rowboat. Those which hide usually remain quiet until they believe they are discovered, when they try to run, but they are slow and clumsy runners.

Gulls were the Black Duck *(Anas rubripes)*, Spotted Sandpiper *(Actitis macularia)*, Ruby-throated Hummingbird *(Archilochus colubris)*, Purple Finch *(Carpodacus purpureus purpureus)*, Song Sparrow *(Melospiza melodia melodia)*, Yellow Warbler *(Dendroica aestiva aestiva)*, and Maryland Yellow-throat *(Geothlypis trichas trichas)*.

The colony of Gulls was first shown to me in June, 1912, by Mr. E. C. Allen, now of Halifax, N.S., who has given a brief account of it in his "Annotated List of Birds of Yarmouth and Vicinity, Southwestern Nova Scotia" (Trans. N.S. Inst. of Sci., Vol. XIV, Part 1, pp. 67-95, Jan. 5, 1916). A month later I again visited it, this time in company with Mr. Howard H. Cleaves, now of Albany, N.Y., who then made some splendid photographs of the gulls in their home, some of which were published in the 'National Geographic Magazine' for June, 1914, and some of which, by his kind permission, appear herewith. I visited the colony in July, 1913, and July, 1914, also. In those years there were not more than two-thirds



THE CHALLENGE—A GREAT BLACK-BACKED GULL CALLING AT LAKE GEORGE.
Photo by Howard H. Cleaves; reproduced by permission—Cut by courtesy of Dominion Parks Branch.

On the gentle slopes of the islands the nests are mere hollows in the earth, generally with some lining of sticks and dead grass or *Usnea* lichen. Nests which are placed on piles of large boulders are much more substantial, as the character of the site necessitates, and are solidly built of grass, sticks, and rubbish. In some cases I noticed that the grass was still green. In one instance only did I find a nest lined with down, and, as that was on Round Island, it was probably a Herring Gull's nest.

Other birds observed on the islands used by the

as many Gulls in the colony as I found there in 1920, so that it is evident that the colony is making encouraging growth.

It is earnestly hoped that, through the powers conferred by the Migratory Birds Convention Act, this colony of Gulls may be made a permanent reservation, and that the friends of bird protection in Canada may do everything possible to assist in bringing this about. Although all Gulls are protected by the Act, yet the general protection thus afforded must often, from force of circumstances, be insufficient, and to make this splendid colony a reservation, with a local warden during the breeding season, would add greatly to its chances of survival and growth. At present, although the wardens in the Maritime Provinces are alive to the situation and are doing their best, these Gulls must depend for protection largely on lack of widespread knowledge of their breeding at this place and on poor boating facilities on Lake George. As the country about the lake becomes more thickly settled, the chance of sudden irreparable injury to the colony becomes greater each year, and special protection should be given before any such harm, of which we have had too many sad examples elsewhere, is actually committed. No chances should be taken with such a colony as this, the largest and the most southern and accessible colony in the world of the greatest and grandest of our Gulls. The islands used by the Gulls are small, with small timber of negligible value, and are quite valueless for other purposes, for neither man nor domesticated animals can be allowed to live on them, because the waters surrounding them are a source of water-supply for Yarmouth town. On the other hand, such an eminent authority as C. W. Townsend, M.D., has stated to me that "the presence of these Gulls would have no effect on the potability of the water, or perhaps a beneficial one, as they would at once remove all dead fish or other animal matter that might otherwise pollute the lake." Although such a large number of Gulls must obtain the greater part of their food supply elsewhere than at the lake, yet they do not



PUSHING OFF—A GREAT BLACK-BACKED GULL IN THE ACT OF TAKING FLIGHT.
Photo by Howard H. Cleaves; reproduced by permission—Cut by courtesy of Dominion Parks Branch.

neglect the lake, as some birds might do, but may be seen searching for food even in parts of it remote from their nesting-islands. There seems, therefore, to be every reason for taking action to ensure the preservation at one and the same time of a unique and splendid bit of wild life and of a tireless band of scavengers and guardians of the health of a large town.

THE SPIDERS OF CANADA.

By J. H. Emerton.

The writer recently published, in the *Transactions of the Canadian Institute*, Toronto, a catalogue of the known spiders of Canada, numbering 342 species. This seems small when compared with the numbers in countries where the fauna is better known, but spiders are hard to find and this number represents very well the larger and more common species. Many more will do no doubt be found, as more persons take up the study of these animals.

In 1846, John Blackwall, then the leading student of spiders in England, published in the *Annals and Magazine of Natural History* of London a "Notice of Spiders captured by Prof. Potter in Canada" a few years before in the neighborhood of Toronto. In 1871, he published in the same journal a "Notice of Spiders captured by Miss Hunter in Montreal." In 1875, T. Thorell published in the *Proceedings of the Boston Society of Natural History* "Descriptions of Spiders collected by A. S. Packard in Labrador." In 1876, the writer spent a short time in Montreal and collected a few spiders, which were described in a paper on New England *Theridiidae*, published by the Connecticut Academy in 1882. Between 1880 and 1890, J. B. Tyrrell collected spiders at Ottawa, in the Rocky Mountains and other parts of Canada, and at the same time T. E. Bean, in connection with his work on Lepidoptera, collected spiders around Laggan in the Rocky Mountains.

Since 1900, a considerable number of collectors have interested themselves in Canadian spiders. In 1905, the writer visited western Canada collecting at Vancouver, Lake Louise, Banff and Medicine Hat. The same year G. W. Peckham collected through the same region, especially at Vancouver, Glacier and Banff. In 1914, the writer again visited the Rocky Mountains, and collected in the Yoho Valley and Lake Louise, Banff and Jasper Park, and also at Edmonton, Athabasca Landing and Prince Albert. In 1915, he collected in the lower St. Lawrence Valley, and in 1917 at Le Pas and along the Hudson Bay Railway. The Canadian Arctic Expedition of 1913 to 1916 made a small collection of spiders on the Arctic coast of Canada and Alaska. The Crocker Land expedition also collected spiders on the west coast of Greenland in 1917. Messrs. E. M. Walker and T. B. Kurata of Toronto, collected spiders in 1913 at several points across Canada, and especially on Vancouver Island. Mr. N. B. Sanson of Banff, has collected spiders for several years in the surrounding country, especially on Sulphur Mountain. Mr. M. Taylor of Vancouver, has collected around that city and in the mountains north of it. Mr. Robert Matheson collected in Nova Scotia in 1913. Dr. C. W. Townsend of Boston, on his visit to "Audubon's Labrador" in 1915, collected spiders and extended the known range of several species. Spiders have also been collected in recent years by Mr. Norman Criddle in Manitoba, Mrs. J. H. Faull in Toronto, Mr. Charles Macnamara of Arnprior, Ontario; Mr. F. W. Waugh of Ottawa, Mrs. W. W. Hippisley of Dauphin, Manitoba; Prof. A. B. Klugh of Kingston, Ontario; the late C. G. Hewitt, Mr. Arthur Gibson, and other correspondents of the Entomological Branch of the Department of Agriculture at Ottawa. New discoveries have been noted from year to year in the Entomological Record published annually in the reports of the Entomological Society of Ontario.

The spiders which Blackwall described cannot now be found and apparently no care was taken to preserve them after descriptions were published. The spiders collected by Packard in Labrador have also been lost, and some of their descriptions will never be certainly identified. The spiders collected by Tyrrell and his colleagues are in the collection of the Entomological Branch at Ottawa or in that of Harvard University. The collection at Ottawa has been much increased in the last few years and now contains probably 300 of the species catalogued. The Harvard collection is rich in Canadian spiders and contains most of the

The common spiders of Canada are described and illustrated in "Common Spiders of the United States," by J. H. Emerton, published in 1902, by Ginn & Co., Boston; "The Spider Book," by J. H. Comstock, published in 1912, by Doubleday, Page & Co. and "American Spiders and Their Spinning Work," by H. C. McCook, published by the author in Philadelphia, 1889 to 1893.

author's types and those described by Banks and Peckham. At Toronto there is a small collection with a large proportion of west coast species. The museum at Banff contains large numbers of the spiders living in the neighboring mountains.

The spiders of Canada fall naturally into several faunal groups. The house spiders with which we are most familiar are most of them introduced from Europe or from more southern parts of this continent. The common *Tegenaria derhami* of cellars and barns is a European species. The common round web spider of barns and bridges, *Epeira scricata* is also European, and is never found far from buildings. The still more common spider in houses of all kinds, *Theridion tepidariorum*, is found in caves and under cliffs farther south, but its original home is unknown. The same is true of the large gray *Epeira cavatica* found in barns and sheds through southern Ontario, Maine, and New Brunswick. The European *Epeira diadematа*, a spider of gardens and the outside of houses, has been found at St. Johns, Newfoundland, and at Quebec.

The most distinct faunal group in Canada is the so-called Canadian fauna which occupies the part of Canada originally covered by forest consisting mostly of spruce. This comes to the coast in Maine and New Brunswick, and its southern border extends westward across Maine and Ontario north of the Great Lakes and the prairies to the Rocky Mountains. Several spiders have their southern limits along this border, as the author has shown in the report of the Entomological Society of Ontario for 1917. *Theridion zelotypum* is the most conspicuous of these, making large coarse webs between the spruce branches, with nests in which the female and her brood of young live together through the summer. *Linyphia limitanea* follows much the same range but a little farther north from Newfoundland to Manitoba, and has not been found beyond the Canadian boundary except in northern Maine. *Zilla montana* is another Canadian species that extends across the continent and south on mountain-tops to North Carolina. It lives in trees and on rocks, and settles readily on houses surrounded by forest. It lives also in Europe in the Alps. *Linyphia nearctica*, another species of this group, seems to be very sensitive to its surroundings. It is found usually on spruce trees near bogs from Labrador to the Rocky Mountains, and extends south in the upper forest of the mountains of New England and New York from an altitude of 2,500 feet up to the limit of trees. All these spiders live in trees well above the ground, but other species that live in moss close to the ground have similar distribution. One of these is *Theridion sexpunctatum*, a pale spider with gray and white spots, and another, *Pedanastethus fusca*, a darker gray species resembling *P. riparius* of farther south. All the spiders of the Canadian fauna do not have this restricted range but extend much farther north and south. The species of *Pardosa* which live in open ground in bogs, along river banks and on mountain-tops, extend northward, some of them as far as animals of any kind have been found and also extend southward in bogs to the New England coast, New York and Ohio and on mountain-tops to Colorado. Some of the widely distributed Canadian species extend eastward by way of Greenland and Iceland, into Europe, or westward through Alaska into Siberia.

South of the spruce forest area, the country is occupied mainly by a fauna known as "transition" or "Alleghanian," containing many species of very wide distribution and closely related to the fauna of northern Europe. Through southern Ontario, Manitoba and Saskatchewan, the common spiders belong to this group. One of the most common and conspicuous by its cobwebs is *Agalena naevia*, which makes its large flat webs in grass fields, among low bushes, in dead trees and brush, and even in windows and doorways. These spiders lay their eggs late in the summer in flat cocoons partly covered with leaves and dirt, and adults all die before winter. The young hatch and sometimes leave the cocoon before cold weather, but for the most part wait until the next spring. The large *Epeira marmorea* and *Epeira trifolium* are conspicuous species, and also mature in the late summer and die before winter. In August and September their large round webs hang in large numbers in berry bushes and golden-rod, the brightly colored spiders hidden nearby in a nest of leaves fastened together and lined with silk. *Epeira patagiata* is another common spider of this fauna and extends far north into the Canadian area. It is colored in grays and browns like bark and wood. It makes its cobwebs after dark and leaves them at daylight, hiding in some sheltered place often several feet away. It establishes itself readily in barns and on the outside of houses, porches and fences, both in America and in Europe. The large white flower spider, *Misumena vatia*, lives among flowers all the way across Canada, eating flies and other insects that come to rest and feed on the flowers. Into this part of the fauna come many species of jumping spiders, *Attidae*, *Dendryphantes militaris* and *Dendryphantes flavipedes* live in great numbers on small trees and bushes, making no cobwebs but moving about constantly among the leaves, creeping close to resting insects and jumping upon them. They

are covered with hairs and scales, often brightly colored and iridescent, especially in the males. The common *Salticus scenicus* of both Europe and America lives on the outside of houses and is covered with a mixture of white, gray and yellow scales which give it the color of unpainted wood. It hunts and eats gnats and small insects of any kind. On the ground live several common *Lycosidae*, long-legged running spiders; in the woods, *Lycosa pratensis* and *Lycosa frondicola*, and in the open fields, several species of *Pardosa*. In midsummer the *Lycosidae* carry around their young enclosed in round cocoons attached behind to the spinnerets.

In the southern part of Canada come in a few spiders related to the more southern Carolinian fauna. The most conspicuous of these are the two species of *Argiope*, large spiders brightly marked with black, yellow, and silvery white. They make large, round webs in tall grass and low bushes, especially in low ground near brooks and ditches. Unlike the large *Epeira*, they hang in their webs through the day and so are more generally known. *Argiope aurantia* has been found at Toronto and *Argiope trifasciata* at Ottawa and Montreal. The large burrowing *Lycosa* which are so abundant in southern Manitoba belong to species that range southward as far as Texas. The habits of these burrowing spiders have been described by Mr. Criddle in the *Ottawa Naturalist* of April, 1918.

In the western part of Canada, a Pacific coast fauna extends north from California as far as Alaska, some of its species as far as the Klondike valley and eastward beyond the Rocky Mountains. *Brachybothrium pacificum*, the only Canadian representative of the tropical family *Aricularidae* occurs on Vancouver Island. *Epeira gemma* and *Linyphia litigiosa*, common in California, come north into British Columbia and eastward as far as Medicine Hat. In British Columbia, *Agalena pacific* partly replaces the eastern *Agalena naevia* and *Amaurobius pictus* replaces *Amaurobius benneti*. As yet, however, little is known about the spiders of western Canada and the Rocky Mountains.

North of the coniferous forest of Canada is a country little explored. Its spiders are known only from explorations of Labrador and the Arctic coast. Some of the most abundant species are the same which live in bogs and open spaces through the forest area and even south of it. The most widely distributed of these is *Pardosa glacialis*, which is abundant as far north as Greenland and Banks Land, and south into the United States. Hardly less diffused is *Pardosa greenlandica*, which extends along the coast as far south as Maine, is found at various points across Canada, and is abundant on all the mountains east and west above the trees. *Lycosa albohastata*, a small species brightly marked with black, white and orange, is found running on the sod just above the trees in the mountains of New Hampshire, in the Rocky Mountains, on the coast of Maine and Labrador, and along the Hudson Bay railway, so that it probably extends entirely across Canada near the northern limit of trees. Another arctic species is the variable and handsomely marked *Lycosa pictilis* that lives on the top of Mount Washington, on the coast of Labrador and Greenland and Alaska, and is probably identical with species described from arctic land farther north. *Erigone psychrophila* and other small species living among low plants near the ground are found at various points along the arctic coast from 60° to 80° north. As far as spiders are concerned, no faunal group corresponding to the "Hudsonian" of bird students has been noticed, but may be defined by a more thorough study of the northern border of the coniferous forest.

NOTES ON THE FAUNA AND FLORA OF EAST AND MIDDLE SISTER AND NORTH HARBOR ISLANDS, LAKE ERIE.

BY E. W. CALVERT, ARNER, ONT.

The following observations were made during a two days' trip to the islands, which are situated a few miles west of Pelee island in western Lake Erie. All have rocky shores with much shingle or coarse gravel and have a number of bays and shoals. Owing to a severe gale most of the time was spent on North Harbor island which contains but slightly over an acre in its area. The island is narrow and a ridge follows the centre. The following trees were found, being arranged in order of their abundance:—White Elm, Hackberry, Kentucky Coffee Tree, Sugar Maple, Chokecherry, Cottonwood, Staghorn Sumach and a shrubby willow. Along shore were observed several large stumps of the Red Cedar no doubt flourishing many years ago. Of the shrubs and vines the common elder *(Sambucus Canadensis)* is represented and Virginia Creeper, Climbing Bittersweet *(Celastrus)*, Wild Grape and Poisin Ivy abound. No attempt has been made to tabulate the herbaceous plants as a number were not familiar to the writer.

The item of greatest biological interest however is a large colony of the Common Tern *(Sterna hirundo)* the estimated number of birds being 2,000 to 2,500. Some 800 occupied nests were counted over half of which contained three eggs, about one quarter containing two, a few with four and the remainder with one. The nests were situated on the shingle a few feet above the water. Some were somewhat concealed by foliage and driftwood, others were in plain view but blended rather well with the shingle, thus making it necessary to pick one's steps. Most of the nests were composed of broken reeds and bits of driftwood but in some green leaves were employed, while in still others there was merely a hollow in the shingle; these were exceptional however. The nests were often as close as two feet to one another and were most numerous in the troughs of shingle formed by the action of the waves. The ground color of the eggs is a pale greenish or yellowish buff with variable dark spots sometimes forming a ring at the larger end. The eggs vary greatly in color, even in the same nest very light and very dark examples being frequent. During our whole stay the birds kept up an incessant noise and seemed to treat our presence with great disapproval. While at this island only one bird had hatched this being found just previous to our departure on the 21st of June.

The bird population of the island other than tern was scant consisting of a Red-eyed Vireo and a Song sparrow, a visiting (?) pair of Kingbirds, as well as several Bronzed Crackles and a Crow, present no doubt for nest robbing as the terns made a great noise during their presence. Several Herring Gulls and a Bank Swallow were also noted flying past.

The next island visited was East Sister and contains thirty or more acres, about ten of which is cleared and is planted to peach trees and garden crops chiefly. As might be surmised, owing to its much larger size all branches of the fauna and flora were represented by a larger number of species than was the island previously visited. In addition to the trees enumerated as found on North Harbor the following were found on East Sister:—Basswood, Shellbark Hickory, White Ash, Silver Maple, Aspen, Sycamore, Red Elm and a species of Dogwood. The most abundant bird on this island was the Bronzed Grackle but the House sparrow, Kingbird and Red-winged Blackbird were also well represented. The following were also noted in small numbers:—Crow, Red-eyed Vireo, Wood Pewee, Cedar Waxwing, Cowbird, Robin, Killdeer and Turkey Vulture. According to report the Cottontail is found here but no other mammal is known, but no doubt others occur.

The last island visited is somewhat isolated, being about ten miles from the others and about twelve from the mainland. It contains some eleven acres, all of which are densely wooded, and has high rocky banks. On the side facing east is a promontory of rock and on the opposite side great windrows of gravel where Common Terns nest in great numbers. The tern population of this island was estimated at some 8,000 and the occupied nests at 1,500 to 2,000. Apparently over half of these had been robbed earlier in the season as the unoccupied nests were quite as numerous as the occupied ones. On the day the island was visited (June 22nd) about twenty per cent. of the birds were hatched but probably these did not start to hatch before the 20th.

The trees found on this island were almost identical in species to those found on North Harbor, the Red Cedar being alive in this case and the Sumach absent. Other than the terns, the following birds were noted:—Indigo Bunting, Kingbird, Red-eyed Vireo, Carolina Wren and a flock of about 500 Herring Gulls which left the bar on our approach. A visit to the island on May 30 revealed the pres-

ence of a hatching Black Duck, the eggs of which had probably been laid for about three weeks. Down from the bird's breast was used to line the finely-constructed nest.

To those interested in the nesting of the Common Tern, I would refer them to an article in *Bird-Lore* for August, 1904, where the colonies on the Hen and Chicken group of islands were studied, and to the *Wilson Bulletin* for March, 1916, where a colony off the coast of Massachusetts was studied. Photographs are supplied in both articles and it is interesting to note that in the ocean colony the nesting material is totally different from and more abundant than that employed in Lake Erie.

OBITUARY

JOHN MACOUN, 1831-1920.

ASSISTANT DIRECTOR AND NATURALIST TO THE GEOLOGICAL SURVEY OF CANADA.

Prof. John Macoun, one of the oldest members of the Ottawa Field-Naturalists' Club, died at Sidney, Vancouver Island, B.C., on July 18, 1920, in his 90th year. He was born at Maralin, Ireland, about twenty miles from Belfast, on April 17, 1831. Like many other families in Ireland, after the great depression through famine and rebellion between 1840 and 1850, his family emigrated to Canada in the latter year, and settled in Seymour Township, Northumberland County, Ontario. At that time much of this part of Ontario was heavily wooded, and John Macoun and his brothers, Frederick and James, with their mother, began to clear a farm. Profits were slow in coming, and in order to relieve the situation, John, who felt that his calling was in a different field, began to teach school, as many another bright young man has done in Canada. Teachers were much needed in the country, and soon he had charge of a small rural school. He felt, however, that to succeed as he desired, more knowledge was necessary, so he took a course in the Normal School in Toronto in 1859. Later he was in charge of one of the smaller schools in Belleville, then became head of the public schools there.

All this time his love of nature had led him to study her many forms, but in botany he took particular delight, and by 1874 he had made such a name for himself in this study, that he was appointed Professor of Botany and Geology in Albert College, Belleville, a position he filled with great ability and success until 1881, when, having been appointed Botanist to the Dominion Government, he severed his connection with the college to devote all his time to public service, although since 1872 he had been employed part of the time by the Dominion Government.

In 1872, Mr. Macoun was invited by the late Sir Sanford Fleming to be the botanist of a party on a expedition through the West to explore and to determine the line for the first transcontinental railway, now known as the Canadian Pacific. Associated with the party was the late Principal Grant of Queen's University, who in his book "Ocean to Ocean" gave a description of the trip and the part John Macoun played in it.

In 1875, Mr. Macoun was appointed botanist to an expedition under the leadership of the late Dr. Alfred Selwyn, then Director of the Geological Survey, and assisted in exploring the Peace River and the Rocky Mountains; and in 1877 he was asked to write a report on the country he had visited, and it was this report which brought Mr. Macoun prominently before the public, for in it he was most enthusiastic over the possibilities of the West, claiming that there were immense areas suitable for wheat culture, and for settlement.

He again explored the prairies in 1879, 1880 and 1881, and in 1882 published his very valuable work "Manitoba and the Great North-West," an octavo volume of 687 pages, and still the most complete book on the West which has been published. This was a private enterprise, but the information contained in that book did much to open the eyes of Canadians and the people of other countries to the vast possibilities of the Canadian North-West. On page 213 he wrote: "Much might be written about the future, and calculations made regarding the wheat production of years to come, but such speculations are needless. In a very few years the crop will be limited by the means of export, and just as the carrying capacity of the roads increase, so will the crop."

In 1877, he was invited to write a report on the whole of the western country for the information of the Minister of Public Works in connection with the new railway, and was cautioned not to draw on his imagination. "In response to this I wrote as much truth about the country as I dared," he states in another part of his book, "for I saw that even yet my best friends believed me rather wild on

the 'illimitable possibilities' of the country. When summing up the various areas I reached the enormous figures 200,000,000 acres. I recoiled from their publication on the ground that their very immensity would deny me that amount of credence I desired, so as a salve to my conscience I kept to the large number of 200,000,000 acres, but said that there were 79,920,000 acres of arable land and 100,000,000 acres of pastures, swamps and lakes. My statements were looked upon as those of an honest, but crack-brained enthusiast and little attention was paid to them." The sequel, however, has shown that he was a true prophet.

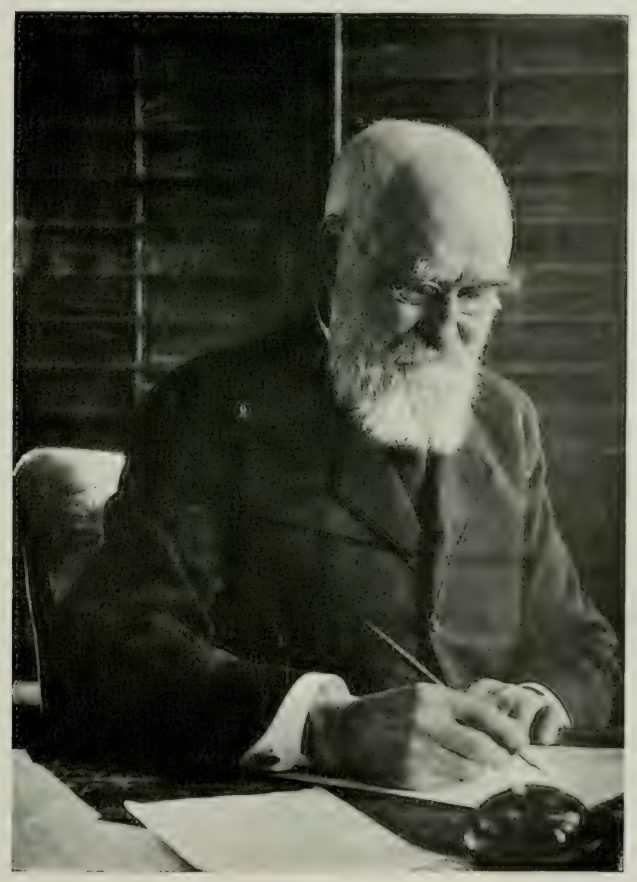
Prof. Macoun was asked to appear before the Agricultural Committee of the House of Commons and other Government bodies a number of times to give information about parts of Canada he had visited which were not well known. After a journey which he made in 1905 along the route of the Grand Trunk Pacific Railway from Portage la Prairie to Edmonton, he was asked by the Agricultural Committee to give a description of the country, and after his address the following resolution was passed:

House of Commons,
Ottawa, 23rd Jan., 1906.

"Moved by Mr. Derbyshire,
Seconded by Mr. Wright, (Renfrew)

"That the thanks of this Committee be now tendered to Mr. John Macoun, Naturalist to the Geological Survey Department of Canada, for the valuable information laid by him before the Committee, on the natural capabilities of that large section of Western Canada extending from Edmonton to Portage la Prairie, on the occasion of his appearance before us, on this subject.

"The Committee desire also to record their appreciation of the valuable services Mr. Macoun has rendered to Canada in the past thirty years of his arduous official services as a



PROF. JOHN MACOUN.

practical science officer of the Geological Survey of the Dominion; notably, are the following explorations of territory:—

"Prof. Macoun's first trip across the prairies was with Sir Sanford Fleming, in 1872. His glowing report of the country traversed caused him to be sent again in 1875, to explore the route that it was then intended that the Canadian Pacific would follow. When the present route was decided upon the Government sent him in 1879, 1880 and 1881 to report upon the country that would be opened up by the railway. Optimistic as his reports and prophecies were, they have all proved true. To these are to be added, Prof. Macoun's explorations in the Canadian Yukon Territory, in 1903, which revealed for the first time, that that far northern division of Canada also possesses agricultural resources of no mean order."

"Motion cordially adopted by Committee, and presented to Prof. Macoun, pro forma, by the Chair."

The Ottawa Field-Naturalists' Club was organized on March 19, 1879, and John Macoun, who at that time lived in Belleville, became that same year one of the corresponding members, and on March 11, 1881, came to Ottawa and delivered an address before the Club on "Capabilities of the Prairie Lands of the Great North-West as Shown by Their Fauna and Flora." He asserted that the botanical test was the only true criterion by which the agricultural status of any district should be judged. In the North-West every species of plant was found to have its particular habit as regards soil and moisture. He had found that even as far north as the Peace River a large number of plants occurred which were of the same general biological type as many Ontario plants, hence he concluded that about the same summer climatic conditions prevailed. He found that certain grasses ripened in the same number of days as wheat in Ontario and the same grasses ripened in about the same time in the North-West, hence the growing seasons were sufficiently alike to ensure the cultivation of wheat over a vast area.

Prof. Macoun moved to Ottawa from Belleville with his wife and family in the autumn of 1882, and lived continuously there until 1912, when he moved to British Columbia. He was President of the Ottawa Field-Naturalists' Club in 1886-7. He was promoted to the position of Assistant Director and Naturalist of the Geological Survey in 1887, which he held until his death. While his home was in Ottawa, he was exploring and collecting in some part of Canada nearly every summer.

It was during these thirty years that he, with the assistance of his son, James M. Macoun, built up the greater part of the herbarium of over 100,000 specimens of Canadian plants, now in the Victoria Memorial Museum, Ottawa, although in the herbarium are many specimens which he collected sixty years ago. He made large collections also in Western Canada between 1872 and 1882. The first part of his "Catalogue of Canadian Plants" was published in 1883, and he continued to publish parts of this list until 1902, when the last number was issued. The parts appeared as follows:—Polypetalae, 1883; Gamopetalae, 1884; Apetalae, 1886; Endogens, 1888; Acrogens, 1890, Musci, 1892; Lichenes and Hepaticae, 1902. The publication of this catalogue was a great undertaking, brought to a successful completion after years of close and personal work. There was a great demand for it, and it is now out of print.

Prof. Macoun began collecting bird skins for the Museum of the Geological Survey at Ottawa in 1879, and through his efforts a large number of skins were obtained from that time on, and before he left Ottawa he had the satisfaction of seeing a very fine collection of Canadian birds there mainly as the result of this work.

He published a Catalogue of Canadian Birds in three parts, the first in 1900, containing the Water Birds, Gallinaceous Birds and Pigeons; the second in 1903, of the Birds of Prey, Woodpeckers, Fly-Catchers, Crows, Jays, and Blackbirds; the third in 1904, of the Sparrows, Swallows, Vireos, Warblers, Wrens, Titmice and Thrushes. These proved very popular and useful, and it became necessary to re-publish them in one volume, which was done in 1909 with the assistance of his son, James M. Macoun. This Catalogue gives the name, range, and breeding habits of Canadian Birds.

He published many years ago a small text book on "Elementary Botany," and from time to time during his long life issued many valuable reports and lists.

He had in an advanced stage of preparation, before his death, an "Annotated List of the Flora of the Ottawa Region, an "Annotated List of the Flora of Nova Scotia," and an "Annotated List of the Flora of Vancouver Island."

He was interested in and loved all branches of natural history, and may be said to have been an all round naturalist, though it was as a botanist he was most known. He was one of the first Canadian Fellows of the Linnaean Society of London, Eng., and was a charter member of the Royal Society of Canada.

The town of Macoun, Sask., was named after him.

Prof. Macoun was a man of very strong vitality and was seldom ill. He had decided that he would spend his last years on Vancouver Island, where in

that mild climate he could be in the open air and collect specimens for most of the year, and had fixed on the spring of 1912 as the time when he would move to British Columbia. No doubt the rush and excitement of closing up his work at Ottawa had something to do with the paralysis which struck him down a few weeks before his intended departure. But, while the attack was a severe one, none of his faculties were affected, and though a few weeks later than the date he had decided upon, he left for British Columbia in April, 1912, with his right arm and right leg somewhat affected by his illness. His health continued to improve, and he was soon roaming the woods of Vancouver Island making collections. He had been collecting mosses since 1861, and when he had found and catalogued practically all the flowering plants in Canada, he devoted much time to the study of mosses, lichens, liverworts and fungi, and when he went to live on Vancouver Island his time was devoted mainly to cryptogams, and he gathered many specimens there.

The Government is often blamed for not showing appreciation of services rendered by members of the Civil Service, but in the case of Prof. Macoun this was not so. When at 81 years of age he decided to leave Ottawa in 1912, and spend the rest of his days in British Columbia, he knew that he might be superannuated as he was past the age limit and still on full salary, but the Government, considering his past record, treated him generously, and he received a copy of the following order-in-council, by which he retained his position in the Service until his death,—

"Privy Council, Canada,
9th June, 1913.

"The Committee of the Privy Council, on the recommendation of the Minister of Mines, advise that Prof. John Macoun, Naturalist and Botanist in the Geological Survey, who is over the prescribed age limit referred to in Rule 40 of the Treasury Board Minute, dated 11th November, 1870, be, in recognition of the worth of his past work, allowed to retain until further notice, his connection with the Department of Mines, outside of Ottawa; his living expenses while engaged on actual field duty only to be a charge against the Geological Survey appropriations."

Rodolph L. Boudreau,
Clerk of the Privy Council.

The Honourable
The Minister of Mines."

SPECIES NAMED AFTER JOHN MACOUN

Perhaps no better tribute to the work of John Macoun can be paid than the list of some of the species of plants, etc., which have been named after him, most of which were discovered and collected by him but named by some other scientist. While there are 45 species in this list, it is not a complete one, but it indicates the large number of new and rare specimens collected by him. Few scientists have had as many species named in honour of them as John Macoun.

FLOWERING PLANTS.

Alopecurus Macounii, Vasey.
Calamagrostis Macouniana, Vasey.
Elymus Macounii, Vasey.
Ranunculus Macounii, Britton.
Lesquerella Macounii, Greene.
Draba Macouniana, Rydberg.
Arabis Macounii, S. Wats.
Potentilla Macounii, Rydberg.
Rosa Macounii, Greene.
Lupinus Macounii, Rydberg.
Astragalus Macounii, Rydberg.
Gentiana Macounii, Holm.
Oreocarya Macounii, Rydberg.
Antennaria Macounii, Greene.
Hymenoxys Macounii, Rydberg.
Arnica Macounii, Greene.
Bidens Macounii, Greene.
Sisyrinchium Macounii, Bickn.

MOSSES.

Andreaea Macounii, Kindb.
Distichium Macounii, C.M. & Kindb.
Encalypta Macounii, Aust.
Entodon Macounii, C.M. & Kindb.
Homalia Macounii, C.M. & Kindb.
Hypnum Macounii, Kindb.
Philonotis Macounii, Lesq. & James.
Pogonatum Macounii, Kindb.
Racomitrium Macounii, Kindb.
Cinclidium Macounii Kindb.
Eurhynchium Macounii, Kindb.
Heterocladium Macounii, Best.
Neckera Macounii, C.M. & Kindb.
Timmia Macounii, Kindb.

LICHENS.

Biatora Macounii, Eckfeldt.
Pannaria Macounii, Tuckerm.

HEPATICEAE.

Anthoceros Macounii, Howe.
Cephalozia Macounii, Aust.
Cololejeunea Macounii, Spruce.
Fossombronia Macounii, Aust.
Lophocolea Macounii, Aust.
Odontoschisma Macounii, Aust.

ECHINODERMS—STARFISH.

Leptasterias macouni, Verrill.

MOLLUSKS.

Boreotrophon macouni, Dall and Bartsch.
Turbonilla (Pyrogolampros) macouni, Dall and Bartsch.

INSECTS—BUTTERFLY.

Oeneis macounii, Edwards.

FISH.

Chauliodus macouni, Bean.

Total, 45 species.

Until the year before he died he continued quite active, but his heart finally gave him trouble, and following a severe attack of whooping cough in the spring of 1920 his vitality was much lowered and after less than a week's confinement to the house he died at Sidney, Vancouver Island, on July 18. During the last few months of his life, when he could no longer go far from home, it was his delight, under the name of "Rambler," to name plants sent in for identification through the local paper, the Sidney Review. After his death the following tribute appeared in that paper: "Rambler" is dead. The beautiful flowers of the forest, which he loved so well, will never again receive the gentle touch of "Rambler." The flowers among which he spent the greater part of his life will miss him no less than those of our readers who took much interest and received great pleasure from this department of the Review. Professor John Macoun, ("Rambler"), died last Sunday morning."

He had many strong and outstanding personal characteristics. His determination and perseverance are marked through all his early explorations, and many accounts might be related where it was nothing but sheer determination that carried him safely through perilous and exhaustive situations. After his recovery from the paralytic stroke in 1912, which left his right hand in such condition that he could not write with it, he determined to write with his left, and from that time on did so in a very legible handwriting. He could never be idle and had nothing to regret in his old age over wasted days and nights, for he worked both night and day until a few years before his death, when he spent his evenings in reading. He was a very wide reader and kept himself well posted on the events of the world to the very last, and, having been a great reader for so many years, he was a veritable encyclopedia. He had a wonderfully retentive memory, and could give the year and the day of the month where he had been when anything out of the ordinary occurred in his personal experience apparently back to his childhood. He could give the scientific name on sight of thousands of flowering plants, mosses, lichens, liveworts, and fungi. His quickness in this respect was remarkable, but quickness was one of his strong characteristics both in his actions and in his speech. His repartee was so keen that he was seldom, if ever, cornered in an argument, and he delighted in discussing any matter of general or personal interest. He had an extremely logical mind and had great power of accurate deduction when given a few important facts. He was very emphatic in his statements, and his enthusiasm was so great that the combination of these two characteristics made his personality a striking one. With these two traits, however, went a very humorous disposition, and many an audience and individual went into bursts of laughter over his way of putting things. His honesty was proverbial and he was very frank and outspoken in regard to wrongdoing. He was kind and generous not only to his family and near friends but to those from whom he did not expect to receive anything in return. He believed that there was an Overruling Power, but that men had much to do in shaping their own destiny.

Perhaps the strongest trait in Professor Macoun's character was a sympathetic undertanding of his fellow-men, one that made him hosts of friends and a much sought advisor in questions of doubt and difficulty. The honesty of his opinion and the straightforwardness with which his advice was given, in conjunction with his sympathetic manner of giving it, secured for him a respect and affection that lasted a lifetime. His wonderful magnetsm and ready tact constituted him a leader of men, and had his great abilities turned to statesmanship he would have been a great power for the good of his country. He was a true Imperialist and a firm believer in the strength and integrity of the British Empire.

His dearest wish was to live until the termination of the Great War, every phase of which he studied with the most intense interest, and his fervent hope was that he might be spared to see a proper readjustment of subsequent world conditions, and a fulfilment of the high ideals that were at stake.

Prof. Macoun was a Presbyterian in religion, and was an elder in St. Andrew's Church, Ottawa, for many years previous to his departure for British Columbia in 1912.

He was married in 1862 to Miss Ellen Terrill, Wooler, Ont., who survives him. His children are: Mrs. A. O. Wheeler, Sidney, B.C.; Mrs. R. A. Kingman, Wallingford, Vt.; Mrs. W. M. Everall, Victoria, B.C.; and Mr. W. T. Macoun, Dominion Horticulturist, Experimental Farm, Ottawa, Ont. His eldest son, Mr. James M. Macoun, Chief of the Biological Division of the Geological Survey, predeceased him by a few months.

W.T.M.

BOOK REVIEW.

REPORT OF THE SECOND NORWEGIAN ARCTIC EXPEDITION IN THE "FRAM," 1898-1902, 4 volumes in 36 parts, large octavo, 1907-1919, 9 maps, 111 plates, and 2,071 pages of text. Published by the Society of Arts and Sciences of Kristiania (Videnskabs-Selskabet i Kristiania), at the expense of the Fridtjof Nansen Fund for the Advancement of Science.

The separate reports of what is sometimes known as the Sverdrup expedition have finally been completed and issued in collected form. The original papers have been published from time to time since the return of the expedition eighteen years ago, and well illustrate how the side lines or by-products of such an enterprise may show their value long after the more spectacular features have been more or less forgotten.

The First Norwegian Arctic expedition, under Dr. Fridtjof Nansen, had the attainment of the North Pole for its main object. After the return of this expedition, Captain Otto Sverdrup, who had been the navigating officer of the *Fram*, returned to the Arctic to explore and map portions of the American Arctic island archipelago. The lands explored by this expedition, Ellesmere island, and the later discovered Axel Heiberg island, Amund Ringnes island, and Ellef Ringnes island, are in the territory of the Dominion of Canada, and their history and resources should be of interest to Canadians. The ship *Fram* was furnished by the Norwegian government, and the remainder of the expense of the four years' expedition, about $60,000, was borne by Consul Axel Heiberg and the Ringnes brothers of Kristiania, and their names are perpetuated in the new lands discovered. The expedition explored and mapped about 100,000 square miles, the greater part of which is new territory.

Captain Sverdrup was assisted by fifteen men. The scientific results were largely the work of G. I. Isachsen the cartographer, H. G. Simmons the botanist, Edward Bay the zoologist, and Per Schei the geologist. In reviewing their work, in *Science*, August, 1920, Prof. Charles Schuchert (Yale University) says: "A better fitted and a more loyal band of hard workers—both men of science and sailors—never explored unknown lands. . . . It is a source of regret that Per Schei did not live to see the final working up of his grand geologic collections, since all attest that this warm-hearted man of science collected a vast mass of material; in fact it may be said of him that he made accessible to paleontology and stratigraphy more information of an exact nature than all previous Arctic expeditions.

"These four volumes, together with Captain Sverdrup's popular account, entitled "New Land" (2 volumes, 1904), should be in every scientific library, not only because of their great intrinsic value, but because we owe it to our Norwegian friends thus to show our appreciation of their splendid achievement."

The astronomical and geodetic observations are worked up by G. I. Isachsen, (141 pages), terrestrial magnetism by A. S. Steen (82 pages), meteorology by H. Mohn (399 pages). The botanical collections by Dr. H. G. Simmons (University of Lund, Sweden) amounted to over 50,000 specimens, and are described in eight papers. Dr. Simmons described the vascular flora, about 190 species, showing that Ellesmere island has at least 115 flowering plants which in general are a continuation of the flora of Greenland although there is a strong American trait that has come from the west. E. Rostrup lists 80 forms of fungi. From over 7,000 specimens of lichens, O. V. Darbishire describes 161 forms. N. Bryhn describes 290 forms of moses, of which 49 are new. F. Ingvarson identified samples of driftwood from the shores and elevated beach lines, and discusses their origin and source. 18 species of migrant water birds and 5 species of land birds are recorded, as well as 9 kinds of mammals (polar bear, wolf, fox, ermine, glutton, lemming, hare, muskox, and reindeer). Of the Crustacea, G. O. Sars describes 154 kinds, including copepods (71), amphipods (38), isopods (11), and ostracods (11). H. H. Gran discusses the phytoplankton, which form the bulk of animal subsistence. 53 species of Mollusca and one braciopod are described by J. A. Grieg; about 50 kinds of bottom-living Foraminifera by H. Kiaer; and 77 species of bryozoans by O. Nordgaard. The Echinodermata are described by Grieg and include 2 crinoids, 6 starfish, 6 ophiurids, 4 holothurians, and 1 sea-urchin. The remainder of the marine fauna include 2 sponges, 4 actinians, 6 sea-squirts, 10 hydroids, 4 medusae, and 44 kinds of polychaete worms.

The very rich geologic results of Per Schei were remarkable for the abundance and variety of the fossils collected, and also for the record of the distribution of the various formations. These showed that the Archeozoic granites of Ellesmere island are overlain by about 14,000 feet of Paleozoic strata, beginning with Upper Cambrian, followed by basal Ordovician (Beekmantown), middle Ordovician, early and middle Silurian, and an extraordinary development of Devonian. The Carboniferous is known only in the highest Pennsylvanian rocks,

followed by marine Upper Triassic. Then there is no sedimentary record of any kind until the deposition of the Miocene fresh-water beds with lignites. As Per Schei died soon after the return of the expedition, the fossils are described by O. Hiltedahl. The land plants of the Upper Devonian and the very few from the Miocene are described by A. G. Nathorst; the Devonian fishes by J. Kiaer; the Devonian invertebrates by O. E. Mayer and S. Loewe; the Upper Carboniferous fauna by T. Tschernyschew and P. Stepanow; and the Triassic marine invertebrates by E. Kittl.

Points of interest to be noted are the richness of plant life in certain spots during the very short growing season. It was noted that flora was most abundant on granite lands and least developed on Paleozoic limestone. It was richest on bird grounds and around Eskimo habitations, and on the whole was sufficient to support the few land animals. The waters are alive with animal life, from minute forms to seals, walrus and whales. The marine fauna does not include a great variety of species, but makes up for this in the abundance of individuals.

R. M. ANDERSON.

NOTES AND OBSERVATIONS.

A PIGEON HAWK WINTERS AT OTTAWA—The past winter 1919-20 with its heavy snow and extreme cold could scarcely have been a worse one for any bird wintering north of its usual range. However that may be, a Pigeon Hawk *(Falco columbarius)* did spend part of the winter in Ottawa and was seen in Mr. E. G. White's garden from January 8th to February 4th, 1920. This sojourn gave an opportunity to study its food habits to a certain extent. It braved the great cold of January during which month the thermometer registered 29° F. below zero on at least one occasion.

Mr. White had many chances to observe it during that time and we both watched it through field glasses for about half an hour on February 2nd.

During its stay it often flew among Mr. White's pigeons, but apparently took no toll of them. It was observed eating a House sparrow on January 9th, and captured a Pine Grosbeak shortly before my visit on February 2nd, strewing its feathers about the garden. Chickadees were apparently beneath its notice, and on February 4th, it remained peacefully on its perch while a Ruffed Grouse budded the bare upper limbs of an adjacent crab-apple tree.

Consultation of some of the bird literature shows that this species occurs occasionally in Quebec and Ontario in winter, although its winter range extends to South America.

Some recorded winter occurences are:

Fleming: *Auk*, Vol. XXIV, 1907, p. 73—Given in the Canadian Journal, 1, 1852-3, as a winter resident at Toronto in 1853.

Nash: Occasionally seen at Toronto in winter.

Terrell: *Ottawa Naturalist*, Vol. XXIV, 1910, p. 39—One seen at Compton County, Quebec, December 2—15, 1909; and ibid—seen at Montreal, Quebec, on December 9, 1908; January 2nd and January 30th, 1909.

HOYES LLOYD.

THE BIRDS OF THE WILDERNESS OF NOVA SCOTIA—On pp. 36 and 37 of *The Canadian Field-Naturalist*, Vol. XXXIV, No. 2, February, 1920, Mr. H. A. P. Smith, of Digby, N.S., tells of noticing an absence of birds, especially song birds, in the interior wilderness of Nova Scotia, and enumerates the ten species which he has found there, one of which, the Song sparrow, he has observed there but once.

It would appear that either Mr. Smith has been very unfortunate in the times and places of his journeys into the Nova Scotia wilds, or that in some way he has overlooked many birds ordinarily to be found there in the breeding season. On the open sphagnum bog, it is true, birds may be scarce, but if there are a few bushes and dead stubs, the White-throated sparrow, the Maryland Yellow-throat, and the Chestnut-sider warbler are almost certain to be present. Among the granite boulders the Nighthawk lays its eggs, at the numerous lakes Spotted Sandpipers, Loons, Great Blue Herons, Herring Gulls, and Great Black-backed Gulls frequently occur, and, where even a small area of woodland has escaped the fire and the axe, Hermit Thrushes, Magnolia Warblers, Chickadees, Redstarts, and a great variety of other woodland birds proclaim their presence.

I have had the pleasure of making a number of journeys into the interior of Nova Scotia, and while, unfortunately, I did not always make notes on the birds, especially the common birds, to be found there, yet I am able to state that I have observed at least fifty-nine species of birds in the Nova Scotia wilderness, the home of the moose and the wild-cat. As the avifauna of Nova Scotia is fairly well known, no attempt will be made to take up space here by enumerating these species (to which no doubt many more might be added) in detail, but the following resume of them may serve to prevent any impression that the interior of

Nova Scotia lacks bird songs in the season of song. The observations on which this summary is based were made in the counties of Yarmouth, Kings, and Halifax.

Loon, 2 Gulls, Great Blue Heron, 3 Snipe, Canada Ruffed Grouse, Barred Owl, Belted Kingfisher, 3 Woodpeckers, Nighthawk, Ruby-throated Hummingbird, 3 Flycatchers, 2 Jays, Northern Raven, Crow, Rusty Blackbird, 7 Finches, Tree Swallow, 2 Vireos, 18 Warblers, Winter Wren, Redbreasted Nuthatch, 2 Chickadees, Ruby-crowned Kinglet, 3 Thrushes.

HARRISON F. LEWIS, BERGERVILLE, P.Q.

PROSECUTIONS, MIGRATORY BIRDS CONVENTION ACT AND NORTHWEST GAME ACT BY OFFICERS OF THE DOMINION PARKS BRANCH AND ROYAL CANADIAN MOUNTED POLICE.

MIGRATORY BIRDS CONVENTION ACT.

George Albert Culbert, Boisevain, Manitoba, for having four live Blue-winged Teal—Fine $10.00.

Fred Z. Boudreau, Boudreauville, Petit de Grat, Cape Breton, N.S., shooting one Red-breasted Merganser—Fine $10.00.

Geoffrey Jeffries, Louidale, Richmond Co., Cape Breton, N.S., shooting one Red-breasted Merganser—Fine $10.00.

Murray Wilson, New Waterford, Cape Breton, N.S., shooting a Black Guillemot—Fine $10.00.

Frederick Mason, Tancook Islands, N.S., shooting Mergansers in P.E.I.—Fine $10.00.

Marcus Schnare, Tancook Islands, N.S., shooting Mergansers in P.E.I.—Fine $10.00.

Sabean Allen, Upper Cape, Westmoreland Co., N.B., shooting a Merganser—case dismissed.

Lloyd Smith, Chebogue, Yarmouth Co., N.S., possession of Canada Geese—Fine $40.00 and costs.

Harold Cain, Arcadia, Yarmouth Co., N.S., shooting at a Bittern—Fine $10.00 and costs.

James Paynter, Clinton, P.E.I., selling Canada Geese—Fine $10.00 and costs.

James Paynter, Clinton, P.E.I., possession of parts of Canada Geese—case dismissed.

Wesley Paynter, French River, P.E.I., possession of Canada Geese—Fine $10.00 and costs.

Charles Paynter, Long River, P.E.I., possession of Canada Geese—case dismissed.

Robert Gibbles, Petite Lamec, Shippigan, N.B., serving Canada Goose at meals—case dismissed.

NORTHWEST GAME ACT.

Peter Alexey (Indian) Husky River, for killing Mountain Sheep—Penalty—7 sheep hides, 1 head and carcasses. Seized and forfeited.

ACCESSIONS TO THE MUSEUM OF THE GEOLOGICAL SURVEY, CANADA—The Museum of the Geological Survey, the *de facto* if not the *de jure* National Museum of Canada has received lately two donations of more than ordinary importance.

One is from Mr. W. E. Saunders, of London, Ont., well known as an enthusiastic and public spirited naturalist. It consists of duplicates which in a life-time's work he has naturally gathered in his private collecting and which he feels would fill a larger sphere of usefulness in the National collections. They number 922 bird and 103 mammal skins. The great value of this particular collection lies in the fact that it contains many specimens collected at comparatively early dates and represent conditions passed beyond recall and upon which we have little or no other data.

The other contribution was made by Mr. Ernest Thompson Seton, who is too well known to require particular personal mention here. It consists of some 102 bird skins and an important collection of zoological books and pamphlets. The former is more notable from the original and unique records it contains than for numbers and the latter includes many rare papers and the proceedings of some small or defunct learned societies that are difficult to obtain.

These donations form valuable additions to our National collections which constitute the basis of exact ornithological work in Canada and as such will be of assistance to all present and future ornithological workers in the Dominion.

P. A. TAVERNER.

THE NAME OF THE "ENGLISH SPARROW"—The House Sparrow, of Europe, since its introduction into America, has been so popularly called the "English Sparrow" that it hardly seems worth while to endeavor to return to the correct designation. Since the beginning of the war, however, there have been some suggestions of obvious intent, to call this undesirable citizen the "Prussian Sparrow." The proposal however is purely academic and there seems little chance that a name so firmly established can be changed in current usage even by the best intentions of the loyal friends of England. During the war, however, there have been some changes in the scientific name of this bird that are interesting to the general public as well as the nomenclaturist.

In *Falco*, No. 2, Dec. 2, 1905, Kleinschmidt, of obvious nationality, separated the bird of the British isles from the continental form under the name of *Passer hostilis* thus commemorating to some degree the Song of Hate in scientific nomenclature. H. C. Oberholser, *Auk*, 1917, 329, states that

whilst the British and the Continental forms may be distinct, the difference is only subspecific and hence the insular bird should stand as *Passer domesticus hostilis*. As undoubtedly our birds are descendents of English stock the same name applies to them. Thus though it does not seem that "Prussian Sparrow" can ever be substituted for "English Sparrow" in this country we really accomplish the same and by a sort of reflex action the opposite of the intention of the original describer, in calling it *hostilis*, the enemy.

P. A. TAVERNER.

LANTERN SLIDES FOR EDUCATIONAL PURPOSES.—For some time the Biological Division of the Geological Survey of Canada has maintained a collection of lantern slides for free educational use. This collection covers about three hundred slides of various natural history subjects. They are mostly from original photographs taken by officers of the Survey though some have been kindly donated by other photographic naturalists. Most of them are unusually well colored and of great photographic as well as zoological interest. The series is still far from complete but it is being added to as rapidly as possible and already it is possible to illustrate a great number of subjects by its means. Birds are principally represented but mammals, amphibians and reptiles are also included in the series.

Collections of these slides are loaned freely to any responsible person or institution to be used for educational purposes and not for personal profit. The only conditions attached to their use are, that they be returned promptly with a report on the occasion of their use and that the borrower pays express charges, if any, and makes good losses not due to ordinary wear and tear.

It is regretted that distance makes it impossible to extend this service west in the prairie provinces, or to the Pacific coast at present, but plans are now being considered for having duplicate sets distributed from the branch offices of the Survey in Edmonton and Vancouver.

Any one desiring to use these slides should make written request to the Biological Division of the Geological Survey, Ottawa, stating his official position, if any, the subject of the lecture it is proposed to illustrate, the society, institution or audience to be addressed, or under whose auspices the gathering is to be held, the number and kind of slides desired and the date. The application should be made well in advance so that conflict of dates can be adjusted. The slides should be returned promptly that others who may be waiting for them and have dates already set may not be disappointed.

P. A. TAVERNER,
Ornithologist, Geological Survey, Ottawa, Ont.

BIRD MIGRATION.—In the May, 1919 number of THE CANADIAN FIELD-NATURALIST there is an article on the above subject by Mr. H. Mousley containing statements which can hardly be allowed to pass unchallenged.

Mr. Mousley rejects as "one of the fairy tales of science" the theory that birds during migration find their way by the sense of sight. He states that "in pure nature there is no such thing as self-consciousness, or the power of reasoning," yet he admits that these faculties are found in man. If man is not a part of "pure nature" then we are forced to the conclusion that he must be regarded as super-natural, a conclusion with which I think few scientific men will agree. Further this statement is not in accord with carefully conducted observations and experiments on the higher animals. Mr. Mousley goes on to say that some of the higher animals, such as dogs, horses, etc., from long and intimate association with man, no doubt at times display traces of it, that is, of self-consciousness or reason. This statement again is contrary to all the data furnished by the study of animal psychology, since no entirely new type of mental process, such as reason, can possibly be evolved by association with man, and all that man can do in the training of animals is to make use of, and develop more fully, faculties already possessed by the animals in question.

Mr. Mousley continues: "All wild birds and animals, however, I believe, are subconscious, and therein lies the secret of their making no mistakes." The onus of proof that wild animals "make no mistakes" is upon Mr. Mousley. If this were true it would be most fortunate for them, but I fancy any close observer of wild life can recall cases in which wild animals have made mistakes, mistakes which in many instances have cost them their lives.

The next statement is: "To understand this more fully one must be prepared to accept the fact that telepathy (now recognized by science) pervades and is general throughout the entire animal kingdom. It is a potential faculty (working on an astral plane unknown to us at present) which interconnects subconscious mind, and permits silent intercourse to be established." I would venture to suggest that telepathy is far from being recognized by the majority of scientific men, that the idea of "astral planes" is regarded by most biologists as a phantasy, and that there is absolutely no proof that any mind can communicate with any other mind, save through the medium of the senses of hearing, sight, touch or smell.

But Mr. Mousley goes even further than relying on telepathy to acount for the directing of migra-

tion and brings in "telaethesia," which he defines as "power of vision passing the limits of time and space." One can readily see what a very useful power this would be, a power more wonderful than all the gifts of prophecy and fairy wands, but one must be allowed to express a slight doubt as to its existence.

If birds are possessed of this miraculous power it is rather hard to account for the fact of their becoming lost in a fog when migrating. A fog certainly might cause them to lose direction if they depended on the sense of sight, but it should have no influence on a purely mental attribute, such as "telaethesia" is assumed to be.

In conclusion I would suggest that if the guiding of migration by the sense of sight is to be regarded as one of "the fairy-tales of science" that Mr. Mousley's theory may be regarded as "fairy-talaethesia."

A BROOKER KLUGH.

A DOPED BUTTERFLY?—Early in September last year in woods on the shore of Lake Missanog, Frontenac County, Ontario, I came across a patch of very large specimens of the poisonous Fly Agaric, *Amanita muscaria*. On the pileus of one of the specimens was a Camberwell Beauty, *Euvanessa antiopa*. It did not take flight when I touched it but merely wobbled weakly from side to side. I picked it up and let it go in the air, but it fell to the ground with closed wings. I then placed it on the trunk of a tree, to which it clung for a few minutes, and then fluttered back to the same fungus, where I left it.

It would seem as if this butterfly had been poisined by muscarine, the extremely toxic alkaloid found in *Amanita muscaria*, though no absolute conclusion on this point can be drawn from this single instance. Its behaviour in returning to its poisonous repast is interesting, but here again no definite conclusions can be drawn from a single instance. I should be glad to hear of any other observations on the relations of insects to this fungus.

A. BROOKER KLUGH.

MORCHELLA BISPORA IN CANADA. Mr. W. S. Odell's note in a recent number of *The Canadian Field-Naturalist*, apparently constitutes the first published record of the finding of *M. bispora*. The Division of Botany, Central Experimental Farm, some years ago (1912) studied some Morels collected by Mr. J. W. Eastham, B.Sc., near Billings Bridge; among them Mr. Eastham showed me *Morchella bispora*, and I well remember the characteristic ascus containing the two large hyaline spores. There is no doubt in my mind that the species then examined is the same as that recorded by Mr. Odell.

H. T. GUSSOW.

MORCHELLA BISPORA IN CANADA.—I was interested in the article "A Rare Fungus New to Canada," by Mr. W. S. Odell in the January number of *The Canadian Field-Naturalist* in which he records *Morchella bispora* from Chelsea, Quebec, and from the vicinity of Ottawa, but I beg to point out that his statement that "There is no record of its having been previously found in Canada," requires modification. In the Ontario Natural Science Bulletin, No. 6, 1910, I first recorded this species from Canada and I reproduce below the original note:—

"*Morchella bispora* is a very common fungus on the Bruce Peninsula, Ontario. It grows abundantly in damp woods, appearing in May, and lasting till early in June. Some of the sporophores attain a very large size. As an edible species it ranks high, as it is tender and of excellent flavour. Dr. Dearness informs me that this species has not been previously recorded from Canada."

The fact that records of the occurrence of species of plants and animals in Canada can be easily overlooked shows the need of some central authority for each group. Such an authority should not be a worker in the group but should be willing to receive and keep on file all records of the distribution of species in his group. I would suggest that the Ottawa Field-Naturalists' Club try and make such arrangements for as many groups as possible, and publish the names of the authorities, so that anyone wishing information on the distribution of species in a certain group can appeal to the proper authority. In this connection I should be extremely glad to receive records of all species of Cyanophyceae (Blue-green Algae), Chlorophyceae (Green Algae) and fresh-water Protozoa of Canada.

A. BROOKER KLUGH.

RUSTY BLACKBIRDS WINTERING IN ALBERTA.—A flock of eleven Rusty Blackbirds have remained in Camrose, Alberta, throughout the past winter. The winter of 1919 and 1920 has been as severe, and perhaps longer than any since the settlement of this portion of the west. The ground was frozen several inches deep by October 10th, and on the 18th of that month eight inches of snow covered the ground. On November 6th the thermometer registered 24 below zero, on which day a flock of Evening Grosbeaks began their residence in Cam-

rose for three months. There were several breaks in the weather before the New Year, but by the middle of January it became very severe, and the thermometer showed 55 below zero for several days towards the end of the month.

The winter came on with such suddenness that many birds must have perished, likely more from want of food than from the terrible cold. On November 4th, tree sparrows and juncos were very plentiful, and seemed to be in an excited condition of mind, being more restless than the chicadees that were with them. On the 10th of the month some boys brought me a Richardson's Owl that they had taken from the limb of a small poplar, even he, seemed to be chilled to the bone and did not resist capture. Before Christmas the snow was 20 inches deep on the level, and a month later I measured it in the woods and found it to be over 30 inches.

Late in January I happened to be at the stockyards one afternoon, and was very much surprised to hear the note of a blackbird, and on looking around saw a flock of eleven Rusty Blackbirds. Most of them were feeding on a stack of oat sheaves, while a few were sitting on the high fence that surrounds the yards. On enquiry I was told that they had been there since the first cold spell, and that on fine days they generally made a flight out to the neighboring farms, always returning before evening. None of the men could say where the birds spent the night, but thought they must have crawled into the stacks or the many crannies around the buildings.

On several occasions after, I visited the yards to see how the birds were wintering, and always found them in the very best of spirits. On very cold days they seemed to be occupied mostly in keeping their feet covered from the frost, this was done by squatting down and spreading out their feathers very much like the way the Horned lark acts while on the ground. Warm afternoons seemed to brighten them up, and feeble attempts were made at chorus singing, but not with the same vigor as is shown by them in the fall before leaving for the South. At this date (March 26th) the flock is seen daily flying to various parts of the town in search of different foods, and there are indications of their mating, six are males and five females. Their plumage is commencing to assume the lustre of spring birds.

Now the question must arise, why have these birds remained through such a long cold winter? Camrose is on the 53rd Meridian, nearly three hundred miles north of the Montana and Dakota lines.

Did they know that this great distance separated them from a more congenial clime, and would not take the chance of a flight that might necessitate a stop where feed and shelter were uncertain? Something told them they had remained too long last fall, and that it would be best for them to accept the hospitality of the stockyards, rather than make an effort to cross several hundred miles of uncharted snow covered plains!

FRANK L. FARLEY.

A UNIQUE ENTOMOLOGICAL EXPERIENCE.—While in camp at Lake Missanag, Ontario, during September, I collected a specimen of *Pedicia albivittata*, a large Crane-fly with black markings on the wings. I placed the specimen in the cyanide bottle fully expecting that, after the usual manner of Crane-flies, it would shed several of its long and loosely-attached legs, and my anticipations were fulfilled by its losing three of these appendages. I removed it from the cyanide bottle, pinned it, and proceeded to stick the three lost legs on with LePage's glue. In this process, which was one of some difficulty and demanded considerable accuracy of manipulation, one of the legs broke at the tibio-femoral joint, but I succeeded in joining it together again and attaching it to the body.

Half an hour after I looked at the specimen to see if all the appendages were still secure, when I observed, to my intense astonishment, that *the leg which had been broken in two was waving up and down.* None of the other appendages were moving and upon touching the abdomen the insect showed no signs of life. This leg continued to wave about for an hour or so, and early next morning it was still moving, and continued to do so intermittently until noon.

The only explanation of this peculiar episode which I can suggest is that some substance, possibly acetic acid in the glue, acted on the muscles of the leg, causing them to contract, and the broken leg moved because it had received a double dose of this substance.

A. BROOKER KLUGH.

THE CANADIAN FIELD-NATURALIST

VOL. XXXIV. OTTAWA, ONT., OCTOBER, 1920. No. 7.

NOTES ON THE FAUNA OF THE MOOSE RIVER AND THE MATTAGAMI AND ABITIBI TRIBUTARIES.*

By M. Y. Williams.

Introduction.

During a geological trip made in the summer of 1919, between the National Transcontinental railway, and Moose Factory, the writer gathered the information contained in this article, on the fauna of the region.

The trip was made by canoe, from Fauquier on the Transcontinental railway down the Groundhog river to Mattagami river, down this to Moose river and thence to Moose Factory, which is situated below tide water nine miles up river from James bay. The return route was up Moose river to the mouth of Abitibi river, up this river to Frederick House river and up this river to the landing near Clute, fourteen miles northwest of Cochrane.

The journey was commenced on August 1st, and was completed on September 5th. Rainy weather between the 22nd and 28th of August delayed travel, and hindered observations materially.

The region traversed is wooded, except for burnt areas, some of which are old and of large extent. The clay belt as seen at Cochrane extends far down river, with the muskeg areas probably predominating over the clay ridges. High sand hills are crossed in the Abitibi canyon, and are reported elsewhere. The region south of James bay is covered with marine silt which is more fertile than the soil of the clay belt.

The rivers have incised their channels from fifty to two hundred feet into the loose deposits, their character, whether slow, rapid or torrential depending upon the rock outcrops. Above the foot of the Long Portage on Mattagami river, and the Otter portage on Abitibi river, the streams are broken, by many rapids and falls, the intervening stretches of water being either slack or of moderate current: this region is underlain by pre-Cambrian gneisses, and other crystalline rocks. Lower down, the country is underlain by limestone, sandstone and shale, and the rivers have few interruptions, although long stretches of rapids occur where the rock flows over limestone and shale ledges.

The river banks commonly rise twenty to fifty feet to a narrow terrace. This terrace which averages about 200 feet in depth, slopes upward to the general level of the country, which is principally muskeg,—a floor of spagnum moss, laurel, and Labrador tea, studded sparsely with black spruce. The terraces are well timbered with stands of white birch, white and black poplar, and white spruce. Where the region is underlain by pre-Cambrian rocks, white cedar, Jack pine, and some tamarack occur. At the water's edge, and on the sand-bars, willows and dogwood grow in dense masses, and during the summer, golden rod, and even red clover grow along the banks at favourable places.

A distinct difference is to be noted between the water of Mattagami and Abitibi rivers. The water of the former is dark in colour, but reasonably clear, while that of the latter is very muddy. This probably accounts for the absence on the Abitibi of fish ducks, fish hawks, and other birds which prey upon fish, although these occur commonly on the Mattagami. Fishing on the Abitibi is likewise very poor.

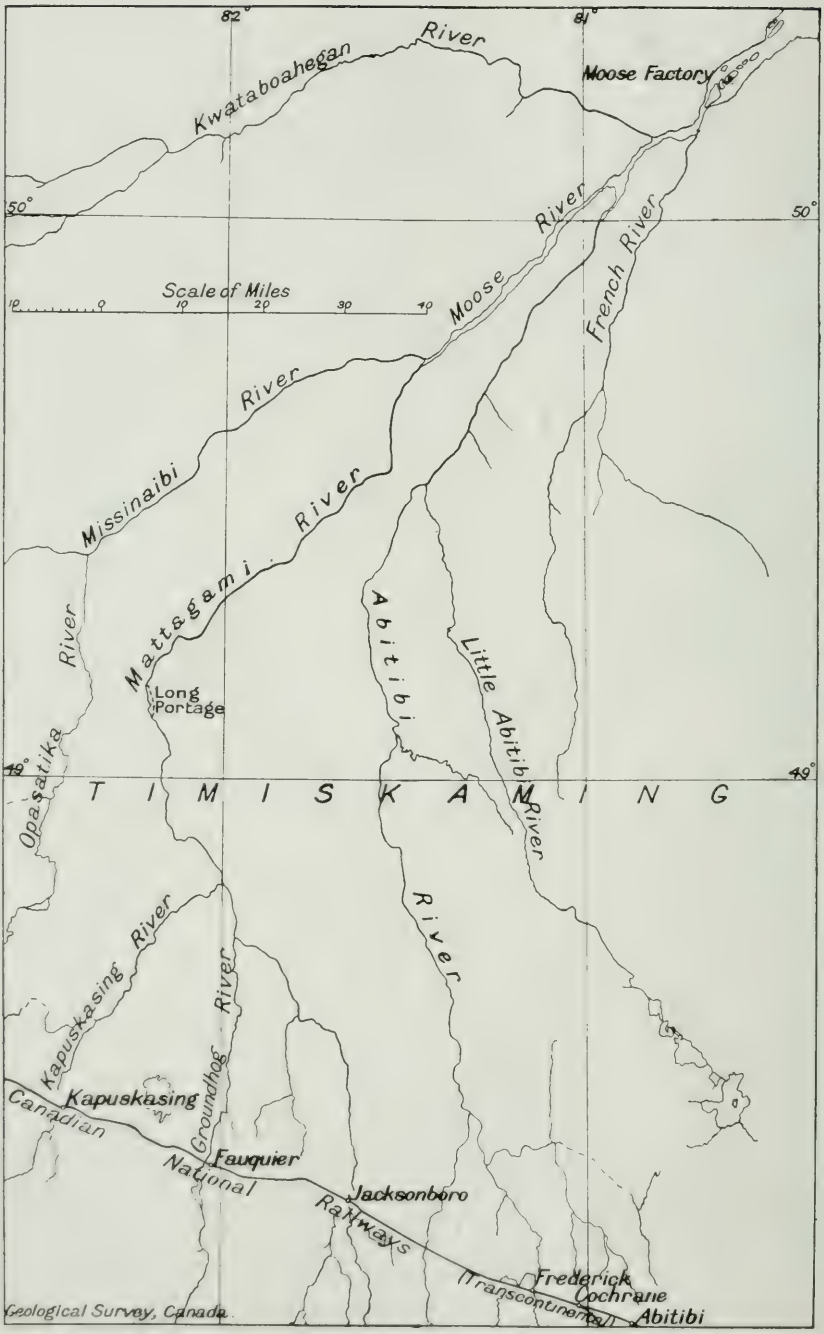
Birds.

COMMON LOON, *Gavia immer*. Two seen at mouth of Kapuskasing river on August 4th, flying from the direction of a small lake lying to the east.

HERRING GULL, *Larus argentatus*. Generally common along the Kapuskasing, Mattagami, and Moose rivers from the National Transcontinental railway to Moose Factory, and up as far as the second rapids above the mouth of the Abitibi river. The greatest number were seen on the Mattagami river between the mouth of the Groundhog and the foot of the Long Portage. One was seen at the foot of the Long Rapids on the Abitibi river. Immature birds in grey plumage were seen on three occasions, one being shot near the second rapids above the mouth of the Abitibi river on August 25th. Dates of observation, August 1st to 29th.

COMMON TERN, *Sterna hirundo*. Several seen almost every day spent between Moose Factory,

*Published with permission of the Geological Survey of Canada.



Index Map, Moose River and lower Mattagami and Abitibi Rivers, Ontario.

Blacksmith's rapids and on the Abitibi river; dates August 17th to 28th. Two were shot, a male and female in adult plumage on August 19th and 20th, one on Bushy island, and one opposite the mouth of the French river.

AMERICAN MERGANSER, *Mergus americanus.* Three adults and several half-grown young were observed on the lower Groundhog river on August 3rd; about thirty young and old on Mattagami above the Long Rapids on August 11th; eighteen off the mouth of Missinaibi river on August 14th; one off mouth of Abitibi river on August 17th.

BLACK DUCK, *Anas rubripes.* Observed as follows:—One near La Duke rapids, Groundhog river, August 3rd; two adults and 2 immature on the lower Groundhog on August 3rd; one immature being shot; thirty off mouth of Abitibi on August 17th; two shot on Abitibi river, four miles above its mouth; one seen at second rapids of Abitibi river; ten about ten miles below Blacksmith rapids of Abitibi river; eight just below Coral Portage of Abitibi river.

GOLDEN-EYE, *Clangula clangula.* A pair on ponds below Long Portage, Mattagami river, August 8th, the female collected. A few others, not identified with certainty along Moose river.

CANADA GOOSE, *Branta canadensis.* One adult in pond at mouth of Pike creek, Mattagami river; one immature at Grand Rapids, Mattagami river; five seen on Abitibi river at second rapids above its mouth.

GREAT BLUE HERON, *Ardea herodias.* One at La Duke rapids, Groundhog river; one at New Post, Abitibi river.

CRANE, *Grus canadensis*, sp.? Fresh tracks on sand bar at low tide, on Moose river, opposite mouth of French river, August 20th. Tracks of three toes, rather thick, and about two inches in length.

WILSON'S SNIPE, *Gallinago delicata.* One seen at Moose Factory, August 18th.

SEMIPALMATED SANDPIPER, *Ereunetes pusillus.* One male shot at foot of Long Rapids, Abitibi river.

GREATER YELLOW-LEGS, *Totanus melanoleucus.* One came into camp on Long Portage, Mattagami river, August 6th; three seen on Moose river at mouth of Abitibi river August 17th; five on Bushy island, August 19th; two opposite mouth of French river, August 20th; three at mouth of Abitibi August 21st; two at mouth of Abitibi river, August 23rd.

SPOTTED SANDPIPER, *Actites macularia.* Two seen at Cochrane, July 30th. Several were seen almost every day of the journey between August 1st and September 1st. One immature bird was collected on Moose river opposite the mouth of the French river, August 21st.

SEMIPALMATED PLOVER, *Aegialitis semipalmata.* A flock of thirty seen at Moose Factory, August 18th; a flock, probably of this species on Abitibi river about 4 miles above its mouth, on August 23rd.

RUFFED GROUSE, *Bonasa umbellus.* One male taken on the Little Long Portage of Mattagami river, August 5th; two immature taken at Blacksmith rapids, Abitibi river, August 28th, and two more seen.

MARSH HAWK, *Circus hudsonius.* One seen at mouth of Missinaibi river, August 14th; and others seen on Moose river, as follows:—one at Grey Goose island, August 15th; one at crossing of Niven's line, August 16th; one at Bushy island, August 19th; one at mouth of French river, August 20th; one at mouth of Abitibi, August 21st. One was seen at the Coral portage on the Abitibi river on August 30th. All were in brown plumage.

SHARP-SHINNED HAWK, *Accipiter velox.* One seen on Long Portage, Mattagami river, August 8th. A small hawk, probably of this species at Niven's line on Moose river, August 16th. On Abitibi river as follows:—one about 4 miles above mouth August 23rd; one near Niven's line, August 26th; one at foot Long Rapids, August 29th; one at Coral Portage, August 30th; one at Red Sucker Creek, September 3rd; one at Cochrane, September 6th.

COOPER'S HAWK, *Accipiter cooperi.* Doubtful identifications. Niven's line, Moose river, August 16th; and second rapids above mouth of Abitibi river, August 24th. Two birds were clearly recognized as belonging to this species, one about ten miles below Blacksmith's rapids on the Abitibi river, August 27th, and the other at Blacksmith's rapids, on August 28th.

RED-TAILED HAWK, *Buteo borealis.* One at Hamilton rapids, Groundhog river, August 2nd; one at Pike creek, Mattagami river, August 11th; a fine adult with red tail at mouth of Missinaibi river, August 14th.

EAGLE, *Haliaeetus leucocephalus*, sp.? A dark-coloured eagle was seen near the crossing of Niven's line on Moose river, August 16th.

AMERICAN SPARROW HAWK, *Falco sparverius.* Five seen at Cochrane, July 30th. Two birds of this species, or else *columbarius* were seen along the lower Groundhog river. Birds satisfactorily identified were seen, one on the Long Portage of Mattagami river, on August 7th; one at the mouth of Missinaibi river on August 14th; two at the crossing of Niven's line on Moose river on August 16th; one at the mouth of Red Sucker creek, Abitibi river, September 3rd; and one at Cochrane, September 6th.

OSPREY, *Pandion haliaetus carolinensis.* Two were seen at the lignite claims on Mattagami river on August 11th, and one the following day at the Grand Rapids. On Moose river, two were seen at

the crossing of Niven's line, August 16th, and one at the mouth of Abitibi river on August 17th. On Abitibi river one was seen at the foot of the Long Rapids on August 29th, and one at the Coral Portage on August 30th.

GREAT HORNED OWL, *Bubo virginianus.* One seen at Three Carrying places, Abitibi river, Sept. 4th, and one was heard that night at our camp a few miles up Frederick House river.

HAWK OWL, *Surnia ulula.* One seen west of Cochrane, July 29th.

BELTED KINGFISHER, *Ceryle alcyon.* One seen at Cochrane, July 29th. Commonly distributed along the lower Groundhog, Mattagami, Moose, and Abitibi rivers, two or more being seen almost every day throughout the trip. The muddy waters of the Abitibi river did not appear to have the same influence on the distribution of the Kingfisher, as on most other fish-eating species. In all between thirty-five and forty individuals were seen between August 1st and September 5th.

ARCTIC THREE-TOED WOODPECKER, *Picoides arcticus.* None seen on rivers, but one individual seen on September 5th in a grove about nine miles northwest of Cochrane.

YELLOW-BELLIED SAPSUCKER, *Sphyrapicus varius.* One immature male shot on island at mouth of Missinaibi river, August 14th.

PILEATED WOODPECKER, *Phlocotomus pileatus.* A note probably made by this species was heard by the writer near Clute, twelve miles northwest of Cochrane ,September 5th.

FLICKER, *Colaptes auratus.* Several seen at Cochrane, July 28th. Two seen on Mattagami river, one opposite mouth of Pike creek, August 11th, and one at Grand Rapids on August 12th. On Abitibi river, one below Niven's line, August 25th, one at same location on August 26th; one at foot of Long Rapids on August 29th; one near mouth of Frederick House river, September 4th.

NIGHT HAWK, *Chordeiles virginianus.* Two were seen at Cochrane, July 29th. Several seen every day between the lower Groundhog and the Long Portage, of Mattagami river, August 3rd to 8th, and several seen each day between the Grand rapids of Mattagami and Grey Goose island, Moose river, August 12th to 15th.

CANADA JAY, *Perisoreus canadensis.* Probably much more common than the number observed would indicate, due to their habit of remaining in seclusion until the camp site is abandoned. One heard on Groundhog river, August 1st; Mattagami river, Long Rapids, one seen each day, August 7th, 8th, and 9th. Moose river, one seen opposite mouth of French river, August 20th; Abitibi river, heard near mouth, on August 23rd and 24th; two seen near second rapids above mouth on 24th; one near Niven's line on 25th; four at same locality on 26th; two at Blacksmith's rapids on 28th; one at foot of Long Rapids on 29th; two at Coral portage on 30th. One male collected near New Post on September 1st.

RAVEN, *Corvus corax.* Seen on Mattagami river, as follows:—one below mouth of Groundhog, August 3rd; two on Long Portage, August 10th, and one on 11th; three at mouth of Missinaibi, August 14th; two on Moose river, near Niven's line, August 16th. On Abitibi river:—one at mouth, August 17th; one at Second rapids above mouth, August 24th; one at Blacksmith's rapids, August 28th, one at foot Long Portage, August 29th; one at Coral Portage, August 30th; one at New Post, September 1st; one at Frederick House, September 4th.

AMERICAN CROW, *Corvus brachyrhynchos.* Several seen at Clute, September 5th.

HOUSE SPARROW, *Passer domesticus.* Three seen at Moose Factory, August 18th. Mr. McLeod, Factor at New Post, but formerly of Moose Factory, says that the sparrows came to Moose Factory about eight years ago, and that many die every winter.

AMERICAN GOLDFINCH, *Astragalinus tristis,* sp.? Fifteen birds probably of this species, but possibly Pine Siskins, were seen on the Lower Groundhog river, August 3rd.

SAVANAH SPARROW, *Passerculus sandwichensis.* One specimen taken at the foot of the Long Portage, Mattagami river, August 8th. These sparrows are so dark in colour as to be quite unlike the Savannah sparrows of Southern Ontario; the commonest sparrow of Moose river and the tributaries travelled.

WHITE-THROATED SPARROW, *Zonotrichia albicollis.* Fairly common, being either seen or heard almost every day of the trip. In song until August 27th.

JUNCO, *Junco hyemalis.* Well distributed. Mattagami river:—Long Portage, several August 8th; Pike Creek, two August 11th; Grand Rapids, two, August 13th. Abitibi river:—mouth, two August 17th; four miles above mouth, two, August 23rd; at Second rapids, above mouth, common, August 24th; Blacksmith's rapids, two, August 28th; Long portage, several September 2nd; Frederick House, river, common, Sept. 5th.

SWAMP SPARROW, *Melospiza georgiana.* Birds doubtfully referred to this species were seen August 13th and 14th, on the Grand rapids of Mattagami river, and again on the Second rapids above the mouth of the Abitibi river, on August 24th.

TREE SWALLOW, *Iridoprocne bicolor.* Several observed on the Groundhog river on August 2nd and 3rd, and on Mattagami river at the Long rapids on August 7th. A single bird at the second rapids above the mouth of the Abitibi on August 24th.

BANK SWALLOW, *Riparia riparia.* Nests common along Grand Rapids of Mattagami river, and also on Moose river near Niven's line. Six birds seen near mouth of Abitibi river, August 17th. Nests common near Niven's line on Abitibi river.

CEDAR WAXWING, *Bombycilla cedrorum.* On Groundhog river common August 1st to 3rd. Several on Little Long Portage, Mattagami river, August 5th. Several at Bushy island, Moose river, August 20th. Heard on Lower Abitibi August 23rd and 24th. Common at Blacksmith's rapids, and at foot of Long Portage, Abitibi river, August 28th and 29th.

RED-EYED VIREO, *Vireosylva olivacea.* Mattagami river:—one taken at foot of Long Portage, August 8th. Very common there on 8th and 9th; one at Grand rapids, August 11th. Several seen below Niven's line, Abitibi river, August 26th.

MYRTLE WARBLER, *Dendroica coronata.* Two at Grand rapids, Mattagami river, August 12th.

AMERICAN REDSTART, *Setophaga ruticilla.* One immature male taken near mouth of Abitibi river, August 21st. Several others seen.

MARYLAND YELLOW-THROAT, *Geothlypis trichas.* One seen on lower Abitibi river, August 24th.

BLACK-CAPPED CHICKADEE, *Penthestes atricapillus.* Commonly seen or heard on the portages throughout the trip.

HERMIT THRUSH, *Hylocichla guttata.* One seen at Long Portage, Mattagami river, August 7th.

AMERICAN ROBIN, *Planesticus migratorius.* Common on Groundhog, August 1st and 2nd, nest and two young, on branch five feet above bridge on Long Portage, Mattagami river, August 6th. Heard at mouth of Missinaibi river, August 15th. Two seen on Bushy island, Moose river, August 19th; heard at foot of Long Rapids, Abitibi river, August 29th; one seen at New Post, September 1st.

MAMMALS.

SHREW, *Sorex*, sp.? One seen near Lignite claims, Mattagami river river, August 11th.

BLACK BEAR, *Ursus americanus.* One swam across river ahead of the canoes near Wawadasing rapids, Mattagami river, August 5th. Tracks at mouth of Missinaibi river, August 14th. Destruction of dogwood bushes due to bears common along Abitibi river below mouth of Frederick House river, September 4th.

GREY WOLF, *Canis occidentalis.* Tracks identified by Indian guides as those of wolves, common along Mattagami and Moose rivers, August 3rd-14th.

BEARDED SEAL, *Erignathus barbatus.* One taken near Moose Factory on August 18th. Others seen on bars in river near Moose Factory.

CHIPMUNK, *Eutamias quadrivittatus borealis.* Seen occasionally on the portages of all the rivers travelled. One taken at Long Rapids, Mattagami river, August 12th.

RED SQUIRREL, *Sciurus hudsonicus.* Fairly common in heavier timber. One taken at foot of Long Portage, Mattagami river, August 8th.

BEAVER, *Castor canadensis.* Signs fairly common above Grand Rapids, Mattagami river, where an adult was seen in company with young on August 5th.

NORTHERN HARE, *Lepus americanus.* One young one caught in snare near camp at Whist Falls, Groundhog river, August 2nd. No others seen on trip.

MOOSE, *Alces americanus.* One killed by Indian, seen near Little Long Portage, Mattagami river, August 4th. A large bull killed by campers above Grand Rapids, August 5th. A yearling bull killed by our party near Lignite claims, Mattagami river, August 11th. Tracks common at mouth of Missinaibi river.

BATRACHIANS.

NORTHERN FROG, *Rana septentrionalis?* Several seen at Little Long Portage, Mattagami river, August 4th. One seen at Moose Factory, August 18th.

AMERICAN TOAD, *Bufo lentiginosus.* One specimen of a pink shade and small size seen near head of Long Rapids, Mattagami river, August 11th. One seen at Missinaibi river, August 14th; several large and small at Moose Factory, August 18th; one on August 22nd, and one on 23rd on Abitibi river three-quarters of a mile above its mouth.

REPTILES.

GARTER SNAKE, *Thamnophis sirtalis.* One seen on Little Long Portage, Mattagami river, August 4th.

FISH.

LAKE STURGEON, *Acipenser rubicundus?* One large sturgeon seen by my men on the Long Rapids of the Mattagami river.

PIKE, *Lucius lucius.* Common and very large in pools at foot of Long Portage, Mattagami river. Taken up to twelve pounds in weight, August 6th and 7th.

PICKEREL, *Stizostedion vitreum.* Common along Groundhog and Mattagami rivers. Taken up to nine pounds in weight at foot of Long Portage, Mattagami river, August 6th and 7th.

SUCKER, *Moxostoma*, sp.? One dead on shore near foot of Long Rapids, Mattagami river, August 12th.

INSECTS.

MOSQUITOES. Not very numerous along rivers, except at mouth of Missinaibi. Very plentiful at Moose Factory, on August 18th and 19th, and in general below tide water.

MOURNING CLOAK BUTTERFLY, *Aglais antiopa* L. Two seen near foot of Long Rapids, Mattagami river, August 13th.

THE LARGER FRESHWATER CRUSTACEA OF CANADA AND ALASKA.

BY FRITS JOHANSEN.

INTRODUCTION.

Though the freshwater-crustacea are of great importance as food for fishes, birds, water-insects, etc., occuring in vast numbers even in ponds, and certain of them (Malacostraca) are conspicuous enough by their size, their occurrence in Canada and Alaska has been little studied, apart from cray-fishes. A. G. Huntsman has already called attention to this fact in his "Freshwater-Malacostraca of Ontario," (Contributions to Canadian Biology 1911-14, Fasc. II, p. 145), and he also there emphasizes how comparatively little is known about their habits and life-histories, on which their distribution in and their introduction into the innumerable ponds, creeks and lakes in Canada depends.

So far as Alaska is concerned cray-fishes are not found there (they may occur in southern Alaska), and the other freshwater-crustacea do not seem to have appealed much to the many collectors in that territory as of sufficient interest, even to the extent of their picking up a few odd specimens, so easily secured by pulling up water plants, by using a catcher from the margin of a lake or pond, or by examining stomachs of fishes caught. The writer has had personal experience of how common freshwater-crustacea are along the arctic coast of Alaska, and it is to be hoped that future collectors will connect up the collections made here with the data secured in the western provinces of Canada, by an examination of the bodies of freshwater in the more southern parts of Alaska and of Yukon Territory, so easily accessible all the year round.* As is the case for the United States so also for Canada the hitherto published records of freshwater-crustacea refer mainly to the Great Lakes and their ramifications and tributaries. The present writer has only a few new data or collections to record from this area, and has only a tourist's acquaintance with these extensive bodies of water. The present article therefore does not claim to treat the basin of the Great Lakes exhaustively; other writers are more qualified to do so, and as mentioned, these bodies of freshwater have been studied fairly well before (see bibliography), even Georgian Bay and other purely Canadian (Ontario) localities (Huntsman).

But, thanks to the efforts of various Canadian expeditions and collectors quite a few freshwater-crustacea have been collected in Canada and the arctic part of Alaska, in various ponds, lakes and streams, particularly in more recent years. I have gone over most of the larger forms from the collections (Amphipods, Isopods, Phyllopods), except cray-fishes, in the possession of the various museums in Canada; and by letters and words I have tried to stimulate the securing of further data, in particular from hitherto quite unrepresented areas. The result has been most gratifying and the time seems now opportune to publish these many data, which perhaps will create a still greater interest in the subject. I may add that the freshwater-crustacea (Amphipoda, Phyllopoda, Cladocera, Copepoda, Ostracoda) I secured along the arctic coast of America while with the southern party of the Canadian Arctic Expedition, 1913-16, are treated in detail by various specialists in Volume VII, of the scientific reports of the said expedition (Ottawa, 1920), so I need only here refer to these reports.

To give an idea of the many widely separated localities in Canada and Alaska from which we (mainly the Victoria Memorial Museum, Ottawa) have specimens of freshwater-crustacea I mention the following places:—Teller (Port Clarence); Point Barrow, Camden Bay, Demarcation Point and Herschel Island, along the north coast of Alaska and Yukon Territory; International Boundary line between New Rampart House and Arctic coast; Cape Bathurst and various places on the south side of Dolphin and Union Strait in Arctic Canada; Fullerton on the west side of Hudson Bay; east coast of Grinnell land; Labrador coast and Newfoundland; western, northern and eastern coasts of Greenland (collections in Copenhagen); west side of Cape Breton island, N.S.; Nova Scotia, (according to Dr. Marsh's and Juday's letters to me of March 10, 11, 1920); Magdalen islands, Tadousac and Quebec City, P. Que.;

*See recent collections recorded by Pearse (1913).

Thousand islands, N.Y.; Great Lakes; neighbourhoods of Montreal, Ottawa and Hull; various localities in middle and southern Ontario; a few localities in the middle and southern parts of Yukon Territory and the four western provinces, Manitoba, Saskatchewan, Alberta and British Columbia.

The freshwater-crustacea known from the localities given above are in some cases both Malacostraca and Entomostraca; in other cases only one of these two sub-classes; in again other cases only certain orders belonging to one or the other of these subclasses have been collected; finally it is often only certain families or genera which occur in these more northern parts of the American continent.

The freshwater Entomostraca are mostly circumpolar in distribution, and are perhaps best treated from this point of view (as will be seen from the Canadian Arctic Expedition reports); and as the available records of them have been published rather fully in various countries, I do not intend to include such, in this article, apart from the Phyllopoda (Branchiopoda).

The freshwater Malacostraca occurring in Canada and Alaska are, however, properly to be considered continental forms, outrunners from their much more numerous representatives in the United States. It is interesting to recall in this connection, that no Decapods or Isopods are known from the arctic and subarctic regions of Canada and Alaska; and that though the Amphipods are known to occur all the way to the arctic coast of the mainland (at least west of Hudson Bay), there are no records of them hitherto from the islands composing the Canadian Arctic Archipelago, though they are probably found at least on the more southern islands. That no freshwater Malacostraca are known from Greenland is also significant. The details about this most interesting point (the distribution northward) will be given later in these articles; suffice is it to say now that the Decapoda going farthest north are certain species of cray fishes; and of Isopds and Amphipods probably only the three common forms, *Asellus communis*, *Gammarus limnaeus* and *Hyalella knickerbockeri*.

Unfortunately we have practically no records of freshwater Crustacea from the vast area outside the localities given above for this continent, except in so far as certain species *(Gammarus limnaeus, Hyalella knickerbockeri)*, which are distributed over the whole of the mainland part of Canada and Alaska or more southern species *(Mancasellus tenax*, certain Amphipods and cray-fishes*)*, are concerned. It is, therefore, most desirable that material be collected in the following two areas; the whole subarctic part of the continent from Alaska to the Labrador Peninsula (Ungava), and the islands composing the Canadian Arctic Archipelago. It is my hope, that future collectors in these regions will pay far more attention to the freshwater-crustacea than has been done heretofore. Each collection will have considerable value, not only from a scientific but also from an economic point of view, particularly in a country like Canada where the freshwater occupies at least fifteen per cent of its total area, and the fish living therein which depend so largely upon these crustacea form one of our great national assets.

AMPHIPODA.

The general appearance of these crustacea, the great majority of which are found in the sea, (about two dozen species occurring in freshwater upon this continent), may be supposed to be fairly well known to the general public, who will have noticed them in great numbers in the small pools around stones or under sea-weed along beaches at low tide. They are commonly called "shrimps," though this name properly should only be used for certain "Decapod" crustacea (prawns, etc.) "Sea-weed-lice" or "beach-fleas" are really better names and are popularly used, for instance in the Scandinavian countries. Ortmann (l.c.) gives "scuds" as the popular English name for them. The main characteristics of these crustacea are an arched outline and a compressed, many segmented body; the lack of carapace and of stalked eyes; the feelers (antennae) and legs are also considerably shorter than in the true "shrimps." They swim mostly vertically in the water by bendings of the body and rapid, continuous movements of the paired "tail feet" (pleopods), while the body-legs (peraeopods) help in the balancing of the animal and the mouthparts (maxillipeds) are kept ready for any food. When they reach the water surface it will often be seen that they seem unable to descend again, and swim around in circles on their sides. The reason for this is that the air gets in under the protruding parts (pleura) of the body segments (somites), so that the animals become lighter than the water. They feed mainly upon decaying animal and vegetable matter, and are therefore, especially the smaller forms, often found among water plants, etc. It is well known how quickly meat-bones, dead fishes, etc., lowered into the sea or a lake are gnawed clean by these crustacea, so that only the skeleton-parts remain. In size they range from a few centimetres to some giant, marine, forms, several inches long. The females carry their many eggs in a sort of brood-pouch on the underside of the body between the legs, and the embryos go through their whole development here, so that when they are "born" they have practically the same appearance as their parents, a rather unusual thing among the crustacea. Even the recently emerged young ones keep for a

while to their mother and remain inside the brood-pouch, so that when such a mother animal is caught, if placed in a glass of water and disturbed by being touched with a stick, a stream of tiny young ones will be seen leaving the mother and swimming around in the water just as do the full grown amphipods. The time in the summer in which the birth of the first brood takes place in Canada and Alaska depends somewhat on the particular species and upon the latitude and longitude. Generally, it may be said, that it takes place about a month after the freshwater-ice begins to melt in the spring, in the neighborhood of Ottawa it happens in May; on the arctic coast west of Coronation gulf, Northwest Territories, in July. There seems to be an interval of two months between two successive broods at least during the summer, (May to Sept. inclusive), and probably a still longer period between the broods during the winter (October to April inclusive).

In the same way as is the case with the marine forms, which await the return of the tide upon the sand under moist sea-weed, so also are the freshwater Amphipods very tenacious to life. They will congregate under stones, boards, etc., or be found along the margin of large lakes under washed up material. It is likewise interesting that certain species at least are equally at home in sluggish, almost putrid water and in running creeks and clear mountain lakes, and that they are found in the alkali lakes of our western provinces as well as in the ponds hidden in the woods all over the country, and in springs as well as in arctic lakes. Their importance as fish-food may be gathered from the fact, that I have found the stomachs of trouts from lakes in the arctic literally "stuffed" with these crustacea, in the same way as the marine species make up the main food of fishes, seals and sea-birds in the Arctic and as is also known, in more southern latitudes.

As to the detailed difference between the various species of freshwater-amphipods known from Canada and Alaska I refer the reader to C. R. Shoemaker's report (1920) and A. G. Huntsman's paper (1915), mentioned in the introduction. A key to the determination of all the freshwater crustacea (Malacostraca), occurring in North America is given in Ortmann's article (1918), (see also bibliography for other papers).

Three families of freshwater amphipods occur on this continent all of which are represented in Canada, but probably only two of them in Alaska. The two first families are distinguished from the third (Orchestiidae) by the presence of a secondary short flagellum on the 2nd antennae (antennula), and by the fact that the last pair of tail feet (uropods)are not single, but divided into two parts (rami).

The first family (Lysianassidae) is again easily distinguished by the fact, that the 5th pair of body-legs (peraeopods) are considerably shorter than the preceding ones, a rather unique feature among the amphipods. There is only one fresh-water genus *(Pontoporeia)* belonging to this family recorded from this continent and it is doubtful whether there is more than one species, *(P. hoyi*, Smith) though two other species (varieties) have been recorded, *(P. filicornis* and *P. affinis)*. On this continent the first two have so far only been found in freshwater, (deeper parts of Lakes Superior, Michigan, Ontario, Georgian Bay), the last named only in the sea.

The second family (Gammaridae) is represented upon this continent by half a dozen genera, of which however only three are known from Canada, a fourth has so far been found only in Alaska, and the rest occur in caves, and underground wells in the United States. The one Alaskan genus is a small form *(Synurella johanseni)* which I myself found in the tundra ponds at Teller, Seward Peninsula, in August, 1913. It is figured and described in detail by C. R. Shoemaker (1920). It is not likely to be found in Canada as it belongs to an Alaskan and Eurasian genus, thus reminding one strikingly of the phyllopod genus, *Polyartemia.* One of the three genra found in Canada is *Eucrangonyx*, which is distinguished from the other Canadian genus *Gammarus* by having the inner ramus of the uropods rudimentary, and by not having the tail-end (telson) nearly so deeply cleft as is the case with *Gammarus.* The shape of *Eucrangonyx* is more clumsy than that of a *Gammarus* of corresponding size. There is only one species of *Eucrangonyx (E. gracilis*, Smith*)* in Canada, hitherto known from the Great Lakes, (Superior, Michigan and Huron), Georgian Bay and Bond Lake (Toronto), while in the United States it is distributed from Rhode Island to Wisconsin. Outside of the Great Lake system it seems to be limited to Ontario and the Ottawa valley, judging from the following new records:—

De Grassi Point, W.-shore of Lake Simcoe, Ont. May 10, 30, 1917, E. M. Walker, coll., 6 specimens (4 of these are from a large, temporary forest-pool). About 30, (less than ½ cm. long) specimens from ponds near Bond Lake, York County, Toronto, Ont., April 19, 1920, A. G. Huntsman, coll. Collected by myself, surroundings of Ottawa, Ont.: (1) McKay Lake, Rockcliffe, April 13th, 1919, (1 small (5 mm.) immature specimen). (2) Pool-stream in swamp at Deschenes Rapids, P.Q., April 20, 1919, 4 specimens (6-10 mm.), of which two were immature, one full grown male and one mature female with many pink eggs (½ mm. in diameter, shape oval). (3) Fairy Lake, P.Q., May 4, 1919.

One full-grown female with pink eggs. (4) 10 specimens, pool near Gatineau Point, P.Q., May 13, 1917, (3 of the females with eggs). (5) Several specimens (all sizes; full grown female with eggs), from pool at Catfish Bay, Hull, P.Q., May 16th, 1920. (6) Pool in woods at Rockcliffe, Ont., May 24, 1919, one full grown female with newborn young in the brood-pouch. (7) Bight in Ottawa River, Hull Park, P.Q., July 6, 1919; under stones, several specimens mostly full grown females with ripe eggs and young in brood-pouch. Two young specimens from Montreal West, Que., Oct. 19, 1918, A. Willey, coll.

Some interesting facts about the life history of this species will be gleaned from the above new records. There thus seems to be at least two broods each summer, one in May, the other in July, and probably also one in September, in the surroundings of Ottawa. Its frequent occurrence in temporary pools, bights or streams is also noteworthy, and it reminds one of what is known about the phyllopods. When full grown its size is about double that of *Hyalella*, but only half of that of *Gammarus*. It is not nearly so frequent as these two species *(H. knickerbockeri, G. limnaeus)*, though at certain places where it is found it may be common enough, (see above under (2), Deschenes).

Though the color of freshwater amphipods is to a large extent caused by the immediate surroundings and their food, the color of *Eucrangonyx gracilis* is like that of green glass, changing to yellowish or orange in the females at the time the eggs ripen. Its geographical distribution has already been referred to.

Of the genus *Gammarus* we have two species in Canada, of which one *(G. fasciatus)* hardly occurs here at all (outside of the Great Lakes); but the other *(G. limnaeus)* is found over the whole width and breadth of the mainland part of the Dominion and Alaska. *G. fasciatus* is known from Niagara River and Lakes Superior and Michigan, also from Georgian Bay. In the United States it is found from Maine to Wisconsin. It is common enough where it occurs according to various authors (Huntsman, Shoemaker) but I have never observed or collected it myself. It resembles very much the other, more widely distributed species *G. limnaeus*, and the young of the two species are very difficult to separate.

Gammarus limnaeus is differentiated from its near relative *G. fasciatus* by the fact that the long hairs upon the terminal joint of the outer ramus of the uropods, are plumose, and not simple; a character only to be ascertained by the aid of the microscope and with not too young or imperfect specimens. It is interesting to note, that while *G. fasciatus*, as mentioned above has only a limited range in Canada, *G. limnaeus* is distributed over the whole width and breadth of the Dominion* from the American border to the Arctic ocean, the reverse is the case as one goes south on this continent. Mr. Shoemaker tells me, that at Washington, D.C., *G. fasciatus* is far more common than *G. limnaeus*. The latter species is found in larger pools in lakes and in streams, the younger individuals having the habit of hiding under stones and vegetation (moss, algae, etc.), the older ones swimming around freely. As I observed them in the arctic they seem to be found only in lakes which owing to their depth do not freeze to the bottom during the winter, or in creeks (rivers) which were open (or partly so) all the year round. Where they occur in temporary pools and streams at more southern latitudes it can, according to my own observations (Ottawa and St. Lawrence rivers), mostly be explained by the fact that these temporary bodies of water were in connection with the rivers or large lakes earlier in the season, and the amphipods, therefore, probably migrated into them at that time. In the arctic I found them during the period October to June inclusive, when the lakes had thick ice and generally just below the ice. I suppose their main food then is the many Entomostraca (copepods) swarming here. That they live a pelagic life is also indicated by the fact that the many trout caught here had their stomachs filled with them at that period. When the lakes are free of ice or when the ice is thin (July to September inclusive) the amphipods literally swarm in shallow water along the margin of the lake, and seem to find their food more among the many plants (moss, algae) on the stones in such situations. The detailed data for the specimens of this species collected on the Arctic coast (Sadlerochit River, Alaska, Herschel Osland, Yukon Territory, Bernard Harbour, Northwest Territories) have been recorded on p. 16 in Shoemaker's report. Mr. Shoemaker tells me, that the specimens from the warm spring creek tributary to Sadlerochit River, and which lived in water of a temperature from 40° to above 60° F., cannot be distinguished from those from the other arctic localities except perhaps by their average, smaller size.

Curiously enough, egg-bearing females of this very common species, which I have observed so often at many localities in Canada are far less frequently† met with than is the case with the more rare *Eucrangonyx gracilis;* it is perhaps because the

*Huntsman says (l.c.) p. 151 that this species is much less abundant in the waters examined than G. fasciatus; but he did not then know of the many records of G. limnaeus from various parts of the Dominion now secured.

†Two of the specimens collected in Whitefish Creek, Lake Simcoe, Ont., June 17, 1917, by E. M. Walker were egg-bearing females.

development of the *Gammarus* eggs takes place in much shorter time, and are thus not carried for so long a period by the mother-animal compared with *Eucrangonyx*. The young ones are probably born in May, July and September in the latitude of the Great Lakes. *Gammarus limnaeus* is said to range in the United States from Maine to Utah, and has formerly been recorded from Lakes Superior, Michigan and Georgian Bay. It has also (Pearse, 1913) been recorded from lakes in the neighborhood of White Horse, Yukon Territory and Rampart House, Alaska (Porcupine River). I have (beside the Arctic ones mentioned above) a number of hitherto unpublished records from additional localities, which I give here, arranging them from east to west,—

Observed (animals escaped) in pool at Tadousac, P.Q., September 6th, 1919; young individuals.

Stream-pool between St. Lawrence River and Diamond Hill, Quebec City, September 19, 1919; many specimens (4-9 mm. long.)

Bight at Alexandra Bay, N.Y. (Thousand Islands), September 1st, 1919; many specimens up to 10 mm. long (females with eggs.)

I have not yet found this species around Ottawa, though the two smaller freshwater-amphipods, *(Eucrangonyx gracilis*, and *Hyalella knickerbockeri)* are common here; but Prof. E. M. Walker, of Toronto, has sent me some (½ doz.) full grown specimens of this species collected near Whitefish Creek, Lake Simcoe, Ont., on June 17, 1917.

From Manitoba I have before me ten specimens, full grown, about (2 cm. long) collected by E. Criddle, at Treesbank,(Assiniboine River), November 21, 1917; and two specimens (1 smaller, one almost full grown), from Cross Lake (about lat. 54 ½° N.) collected by F. J. Alcock in the summer of 1919.

I have no records of this species from Saskatchewan, though it undoubtedly occurs there, having been found both in Manitoba and in Alberta.

From Alberta I have before me twenty-seven specimens, about 2 cm. long, from Dodds Lake, near Edmonton, collected by a university student there on March 8, 1919 and sent to me by Dr. McLean Fraser of Nanaimo, B.C.

Also ½ dozen specimens from Miquelon Lake, Alberta (about lat. 53° N.), collected on September 30, 1918, by R. M. Anderson, of Ottawa.

Many specimens (mostly full grown) from a marsh in Cabin Lake Creek, Jasper Park, collected by W. Spreadborough, on Aug. 31, 1918.

Also 1½ doz. specimens from the plain near Red Deer and Battle Rivers, east of the foothills, Alberta (about lat. 53° N.) collected by J. B. Tyrrell, June to September, 1885.

From British Columbia I have examined the following specimens:—

Three large ones from Sink Lake, near Stephen, E. Kootenay county, B.C., September 26, 1883, J. B. Tyrrell, collecter.

Half a dozen from Beaver Pond in valley of Kish-e-nek-na creek, (Flathead River, near International Boundary, B.C.) August 27, 1883, J. B. Tyrrell, collector.

We now come to the third family of freshwater-amphipods, namely the Orchestiidae, represented by only one species on this continent—the common *Hyalella (allorchestes) knickerbockeri*, Bate. The other species *(H. azteka* Lauss, *H. dentata*, Smith, *H. inermis* Smith*)* described formerly have proved to be only varieties. In addition to the characters given for the family, (p. 128) this amphipod is immediately recognized by the presence of a curved spine projecting backwards from the middle of the posterior margin of each of the first two abdominal segments, a character which can be seen with the aid of a strong magnifying glass, and reminds one strongly of certain marine (especially arctic) amphipods.*

The biology of *Hyalella knickerbockeri* has been studied by various naturalists and a rather full account of it has been given by H. H. T. Jackson (1912). He says it is a littoral form, only occurring to the depth of about one fathom of water in larger lakes, and that it prefers sluggish streams and lakes, etc., with much vegetation. He states that it feeds almost exclusively on protozoa and algae, which it gets by swimming or crawling. He found it was more active at night than during the day time, also that there was much variety in its color, and that the latter was not solely due to food in the intestine (compare *Eucrangonyx gracilis*, p. 129). The largest specimen he observed was 7.6 mm. long; the females average less than the males in length, but are deeper in the body. According to the author quoted, the species breeds throughout the year, but especially during the summer; while thus engaged the male carries the female, though releasing his hold when the moulting takes place. Soon after copulation the eggs pass into the ovarial sack (brood-pouch) of the female, but they take almost a month to hatch. Jackson paid particular attention to the moults. He found, that there is a varying period (1 to 5 weeks) between the moultings, and that each moult begins with a transverse split in the forepart of the body. Contrary to what is the case with many crustacea (for example the cray fishes) the moulted skins are not eaten by these amphipods after being cast. My own observations on the biology of this animal agree with those of Jackson except that he says it does not occur in temporary

*Shape of Hyalella is more robust and rounded than Eucrangonyx of corresponding size (see p. 129).

pools. In the district of Ottawa, however, it does occur in such pools as will be seen below. On June 22, 1919, I collected a dozen specimens of this species in McKay Lake, Rockcliffe, near Ottawa, the males were often seen embracing (carrying) the females, which had many newborn young in the brood-pouch. When I placed the amphipods in a glass with water the young ones came forth and swam freely around; rather larger examples, but still minute (2 mm. long) ones, were secured in Pink Lake, outside of Hull, P.Q., on September 22, 1919, so there must be several broods during the summer, probably at least every second month.

This species has an exceedingly wide distribution on this continent. It has been recorded from Lake Titicaca, Peru; in United States from Maine to Florida and Wisconsin and across to Mexico, California and Oregon; also 48 miles north of Rampart House, Alaska. The only records of it from Canada were formerly White Horse, Yukon Territory and the Great Lakes (Superior, Ontario, Erie, Georgian Bay) and southern Canada. I am able here to add a number of others, which show that this species occurs in Canada from the Atlantic to the Pacific and from the international boundary line in the south to a considerable distance northward, though it probably does not approach the barren grounds of Alaska and Canada. It would be most desirable to secure data to define the northern limit of this species; I did not find it along the arctic coast west of Coronation Gulf, although *Gammarus limnaeus* is common enough there. As both these amphipods are found in great numbers wherever they occur, and are easily observed and collected it should be a comparatively simple matter to get further data.

The following unpublished records of this species in Canada are based upon specimens in the Victoria Memorial Museum, Ottawa; except where otherwise stated they were all collected by me.

Four young ones from Pembroke Lake, Grand Etang, West side of Cape Breton Island,* N.S., September 2, 1917; under stones.

Three full grown specimens (1 male, 2 females) from pond on Amherst Island, Magdalen Island,* P.Q., middle of July, 1917.

Two small ones from pool at Tadousac, P.Q., September 6, 1919. Several specimens (smaller) from bight of canal at Alexandria Bay, Thousand Islands, N.Y., September 1, 1919.

A great number of specimens of all sizes and both sexes from the surroundings of Ottawa, Ont., and Hull, P.Q., in 1918 and 1919 from June to October (inclusive), both from pools, ponds, lakes, streams and bights of the Ottawa river. More definite Ottawa district localities are:—McLaurin Bay, Gatineau Point, outside the city of Hull, Fairy Lake, the Golf Club grounds, Pink Lake, etc., all on the Quebec side; and McKay Lake, Rockcliffe, etc., on the Ontario side. There is hardly a pool, stream or lake around Ottawa where it does not occur in great numbers.

One young specimen from creek (barred at mouth) emptying into Lake Nipissing, near North Bay, Ont., Aug. 25, 1918; among water-plants.

Three specimens from Cross Lake, Manitoba, summer, 1919, F. J. Alcock, collector.

I have no records from Saskatchewan.

Half a dozen specimens from Miquelon and Dry Meat Lake, Alberta (near Camrose), September 30, 1918, R. M. Anderson.

A couple of specimens from stream pool in woods in Jasper Park, (near Jasper station) Alberta, September, 1916.

One dozen specimens from Beaver Pond in valley of Kish-e-neh-na creek (Flathead river) B.C., August 27, 1883, J. B. Tyrrell, collector.

To sum up, our present knowledge of the distribution of freshwater amphipods in Canada and Alaska is as follows:

One species seems to be limited to the western part of Arctic Alaska; three others to the Great Lakes, the Ottawa Valley and southern Ontario, while two occur from the Atlantic to the Pacific. One of these probably does not reach the barren grounds, while the other is found as far north as the arctic coast, and may thus be termed the only true Canadian species.

Note:—In Europe there occur in freshwater,—*Gammarus pulex* and *G. fluviatilis*. The genus *Gammarus* is known already from tertiary deposits.

*These records suggest strongly, that the species also occur in Newfoundland.

BIBLIOGRAPHY OF CANADIAN AND ALASKAN FRESHWATER AMPHIPODS.

A. G. Huntsman—Freshwater-Malacostraca of Ontario; Contributions to Canadian Biology, 1911-14, Fasc. II., Ottawa, 1915, p. 149-52.

A. G. Huntsman—Invertebrates: Natural History of Toronto Region, Toronto, 1913, p. 273-74.

S. I. Smith—Crustacea of the Freshwaters of the United States America: Rep. U.S. Comm. Fisheries, Pt. 2 (1872-73), Washington 1874, p. 637. A synopsis of the higher Freshwater Crustacea of the northern U.S.A. (east of Mississippi River); p. 690, sketch of the Invertebrate Fauna of Lake Superior.

S. I. Smith and A. E. Verrill—Invertebrata dredged in Lake Superior in 1871, (U.S. Lake Survey): Amer. Journ. Science, Series 3, Vol. II, 1871, p. 452-53.

S. I. Smith—Prelim. Rep. Dredgings in Lake Superior, 1871.

A. L. Weckel—Freshwater Amphipods of N.A.: Proc. U.S.N.M., Vol. 32, Washington, 1907, p. 25-58.

H. H. T. Jackson—A Contrib. to the Nat. Hist. of the Amphipod *Hyalella knickerbockeri* (Bate); Bull. Wisc. Nat. Hist. Soc., Vol. 10, 1912, p. 49-60.

A. E. Ortman—Malacostraca (Higher Crustaceans), in Freshwater Biology (Ward and Whipple), New York, 1918, p. 828-50.

H. A. Nicholson—Contrib. to a Fauna Canad. (Animals dredged in Lake Ontario, 1872): Canad. Journ. Science, Litt. and Hist. (Canad. Institute) New Series, Vol. XIII, Toronto, 1873, p. 490-501.

O. P. Hay—Notes on some Freshwater Crustacea, together with descriptions of two New Species: Amer. Nat. Vol. XVI., 1882, p. 143-46.

P. R. Hoy—Deep-water fauna of Lake Michigan; Trans. Wisc. Acad. Science, 1870-72, p. 98-101.

G. C. Embody—Distribution, Food and Reproductive Captivity of some Freshwater Amphipods; Int. Rev. Ges. Hydrobiol, Biol. Suppl. II.

L. M. Underwood—List of described species of Freshwater Crustacea, from America, north of Mexico; Bull. Ill. Lab. Nat. Hist., Vol. II., 1888.

C. R. Shoemaker—Report of Canadian Arctic Expedition, 1913-18, Vol. VII., Part E, Amphipods, Ottawa, 1920.

A. S. Pearse—Notes on Crustacea recently acquired by the Museum; Occas. Papers of Mus. Zool., Univ. Mich., No. 1., Dec. 20, 1913.

POSTSCRIPT.

The summer of 1920, I spent in James Bay, and along the east side of Hudson Bay to beyond lat. 56° N. No phyllopods nor isopods were found in freshwater, and amphipods only in James Bay, at the following places:

Gammarus limnaeus in creek-pools on the southeast side of Charlton Island, September 26 and 22.

Hyalella knickerbockeri in creek-pools in the interior of Charlton Island (south-end), July 17 and September 22; and in ponds at Moose Factory (field), July to October, and on Cape Hope Islands (about lat. 52½° N.), September 13.

All occurred in great numbers. Those secured at Moose Factory in July, comprised greenish males and yellow-brown, egg-bearing females, in copulation, besides pale, newborn ones.

CHANGES IN THE STATUS OF CERTAIN BIRDS IN THE VICINITY OF QUEBEC, P.Q.

By Harrison F. Lewis.

In the year 1906, Mr. C. E. Dionne published his well-known work, "Les Oiseaux de la Province de Québec," in which, besides noting the distribution of the species of birds in Quebec Province, he stated particularly the status of the different species in the neighborhood of Quebec City, where the greater part of his own field work had been done. The area to which these local records refer is variously designated by Mr. Dionne as "près de Québec," "dans les environs de Québec," or "dans Québec," and is defined by him (footnote (1), page 20) as "within a radius of five or six leagues of Quebec, unless otherwise indicated." Since the publication of this book, Mr. Dionne has been able to do comparatively little field-work in this area.

Since July, 1918, I have been resident at Bergerville, parish of St. Colomb de Sillery, in the suburbs of Quebec, and have done such field work (chiefly in 1919 and 1920) in the vicinity of the city as my other duties have permitted. This work has made clear the fact that, in the fourteen years since 1906, the status of a number of bird species in the area defined by Mr. Dionne as referred to above has changed markedly. There is little doubt that most, if not all, of such changes which I have noted are actual, since Mr. Dionne frequently visited in his work the vicinity of Bergerville and Gomin Wood, where most of my work has been done, although he went even more often to areas northward from Quebec City, where my observations have been occasional only. The majority of my notes relate to land birds; opportunities for observing water birds in the neighborhood where I am resident are very limited. In order to keep the record of birds of the Quebec area as accurately up-to-date as possible, and in order to render readily available some local details of the general avifaunal changes taking place in northeastern North America during the period 1906-1920, I have prepared this paper. A similar paper by Mr. L. McI. Terrill, dealing with the vicinity of Montreal ('Ottawa Nat.', Vol. XXV, No. 4, pp. 57-63, July, 1911), furnished me with the

original suggestion and an admirable model.

In the case of each species of which a change in status is hereinafter noted, I have given, following the English name, a translation of Mr. Dionne's statement concerning his observations on its occurrence here, as found in his book, such translation being terminated by Mr. Dionne's name in parentheses. Then I have summarized my own observations of the species under discussion. In order to ensure that my translations should render the meaning of Mr. Dionne's French sentences as accurately as possible, I have submitted them all to Mr. Dionne, who has most kindly verified them. I am much indebted to Mr. Dionne, not only for this aid, but also for his ever-ready assistance and encouragement in all the work of an ornithological character which I have done at and near Quebec.

The changes of status described in this paper may be divided into the following four classes:

(A) The increase in abundance of many small Warblers, Finches, Vireos, etc., normally of more or less northern breeding range. The chief known factors which may have assisted in causing these birds to increase seem to be their protection by law here and in the United States, the creation of many clearings in the forests of the north, and the absence or rarity of the domestic cat over large parts of their breeding range.

(B) The northeastward advance of five species (Crested Flycatcher, Meadowlark, Vesper Sparrow, Migrant Shrike, and House Wren), originally of more southern or southwestern breeding range. While this may represent the continuation of the northward advance of many species following the close of the last Glacial Period, there is no doubt that it has been greatly accelerated by the cutting of the forests and the settlement of the country by the white race.

(C) The diminution of two species (Eskimo Curlew and Purple Martin), due to very obscure causes.

(D) The accidental occurrence of one species (Blue-gray Gnatcatcher).

The Zone Map of North America, as published inside the front cover of F. M. Chapman's "Handbook of Birds of Eastern North America", 1912 edition, indicates the vicinity of Quebec City to be in the Canadian Zone. The Transition Zone is represented as reaching northeastward along the south bank of the St. Lawrence River about as far as to Levis, P.Q., but as not extending northeast of the Ottawa River on the north bank of the St. Lawrence. The dividing line between the two zones between Montreal and Levis, which is directly opposite Quebec, is thus made to coincide with the St. Lawrence River. There can be little doubt that this is not exactly correct, for the Transition Zone certainly crosses the Ottawa and extends northeastward along the north bank of the St. Lawrence for some distance. Whether or not it should be considered as reaching to Quebec City is a matter on which opinions may differ. It appears to me, however, that the most nearly correct position for this portion of the necessarily arbitrary dividing line between the Transition and Canadian zones is at the southern foot of the Laurentian Mountains, in general some miles north of the St. Lawrence. This would mean that a strip of the Transition zone extends along the north shore of the St. Lawrence as far as Cap Tourmente, about twenty-five miles below Quebec, where the Laurentians finally front directly on the river. A person standing on the Citadel, or even on Dufferin Terrace, at Quebec, can distinguish at a glance the low-lying cultivated, Transition (?) country immediately around the city and along the St. Lawrence in either direction from the elevated, wooded, undoubtedly Canadian mountainous country behind. The following data concerning the status of certain species of birds about Quebec may be of assistance to those interested in this question:

1. Transition species which are summer residents at Quebec: Virginia Rail (not common), Sora Rail (fairly common), Black-billed Cuckoo (irregular), Kingbird (common), Crested Flycatcher (uncommon), Prairie Horned Lark (fairly common), Bobolink (uncommon), Cowbird (uncommon), Red-winged Blackbird (uncommon), Meadowlark (fairly common), Vesper Sparrow (fairly common), Chipping Sparrow (very common), Purple Martin (rare), Blue-headed Vireo (rare), Catbird (fairly common), House Wren (uncommon), Veery (common), and Bluebird (uncommon).

2. Canadian species which are summer residents at Quebec: Pine Siskin (common), White-throated Sparrow (common), Slate-colored Junco (rare), Lincoln's Sparrow (rare), Philadelphia Vireo (not common), Tennessee Warbler (rare), Myrtle Warbler (rare), Magnolia Warbler (fairly common), Bay-breasted Warbler (rare), Blackburnian Warbler (fairly common), Water-Thrush (fairly common), Mourning Warbler (not common), Canadian Warbler (common), Winter Wren (rare), Red-breasted Nuthatch (rare), Olive-backed Thrush (uncommon), and Hermit Thrush (rare).

266. *Numenius borealis* (Forst.). Eskimo Curlew.

This Curlew is more common than the preceding species [*N. hudsonicus*] and frequently occurs on the beaches and in the fields not far from Quebec (Dionne).

No recent record of this species near Quebec is known to Mr. Dionne or myself.

452. *Myiarchus crinitus* (Linn.). Crested Flycatcher.

Mr. Dionne gives no record for this species near Quebec and has never observed it here. I found it an uncommon summer resident near Quebec in 1919 and in 1920. On August 4, 1919, an adult was seen feeding young birds out of the nest at Bergerville.

459. *Nuttallornis borealis* (Swains.). Olive-sided Flycatcher.

Up to the present I have met but three specimens in the woods near Quebec (Dionne).

I have secured the following records of this species—all of singing males—near Quebec: two on June 3, 1919; one on May 27, 1920; one on May 30, 1920; one on June 3, 1920; and one on July 12, 1920.

501. *Sturnella magna magna* (Linn.). Meadowlark.

One individual was killed, some years ago, at Jeune-Lorette (Dionne).

In 1919 and 1920 this species was a tolerably common summer resident in the many suitable fields in the vicinity of Quebec.

514. *Hesperiphona vespertina vespertina* (W. Coop.). Evening Grosbeak.

The first one which, to my knowledge, appeared in the neighborhood of Quebec was killed March 11, 1890, at Jeune Lorette. Later, on November 24, 1903, four individuals were killed at L'Ange Gardien, and, in December, three others were taken at Ste-Foy (Dionne).

Mr. Dionne informs me that a few others appeared near Quebec between 1903 and 1919. On December 26, 1919, I saw a flock of this species, containing four adult males and nine dull-colored birds, between Quebec and Ste-Foy. (See 'Bird-Lore,' Vol. XXII, No. 1, p. 15, January-February, 1920, "Christmas Bird Census, 1919, Quebec, P.Q."). During the remainder of the winter of 1919-20 I observed this species near Quebec on twelve additional occasions, the number of individuals noted on any one occasion ranging from one to five. It was last seen on March 26, 1920.

533. *Spinus pinus pinus* (Wils.). Pine Siskin.

Each autumn we see some small flocks of them in the vicinity of Quebec and even in the gardens and parks of the city. Elsewhere also it is common and it spends the winter in the deep woods (Dionne).

In 1919 and 1920 this was a common summer resident about Quebec, but I have not remarked it in winter.

540. *Pooecetes gramineus gramineus* (Gmel.). Vesper Sparrow.

It is rare about Quebec; so far I have seen but four specimens of it (Dionne).

This species was a regular and tolerably common summer resident near Quebec in 1919 and 1920; a few even summered within the city limits.

567. *Junco hyemalis hyemalis* (Linn.). Slate-colored Junco.

It is likewise very common and occurs in flocks in spring and autumn near Quebec and in the neighboring districts; it does not occur here in summer (Dionne).

The Junco is now a rare summer resident in the immediate vicinity of my residence at Bergerville, where I noted it repeatedly during the summers of 1919 and 1920. On June 21, 1919, I saw an adult Junco feeding a young one out of the nest at Bergerville.

583. *Melospiza lincolni lincolni* (Aud.). Lincoln's Sparrow.

It occurs accidentally near Quebec; up to the present time I have killed three specimens only (Dionne).

In May, 1919, I twice observed an individual of this species near Quebec. In 1920, I observed the species near Quebec as follows: May 11 (one), May 18 (one), May 21 (one), May 23 (three), May 24 (one), May 25 (one), May 27 (one), May 28 (one), May 30 (one), May 31 (two), June 1 (one), July 12 (one), July 25 (one), September 26 (one), October 10 (one). I was absent from Quebec from June 5 to June 27 in 1920. I am confident that Lincoln's Sparrow is a rare summer resident in sphagnum swamps in Gomin Wood, near Quebec, where nearly all of the above observations were made.

584. *Melospiza georgiana* (Lath.). Swamp Sparrow.

In the spring of 1878 I killed several specimens of it at the foot of the slope north of the heights of Ste-Foy, but I have seen it nowhere else (Dionne.).

In 1919 and 1920 this species was a tolerably common summer resident in all the many suitable swampy areas which I visited near Quebec.

611. *Progne subis subis* (Linn.). Purple Martin.

It is common at Quebec as well as at Montreal and nests in these places (Dionne).

The Purple Martin was rare at Quebec in the summers of 1919 and 1920. Mr. Dionne informs me that it has been so since about 1909. I saw it more frequently in 1920 than in the preceding year, which leads me to hope that it is now on the increase.

618. *Bombycilla garrula* (Linn.). Bohemian Waxwing.

Couper says that it occurs sometimes, during severe winters, in small flocks in the woods about Quebec. In the winter of 1890 I obtained six individuals which had been killed at Chateau-Richer, and since then I have seen but two others, some years

later; doubtless it should be found in our woods at that season (Dionne).

On February 22, 1920, I first observed this species near Quebec, when I saw two flocks, one containing five individuals, the other about one hundred and twenty. Other flocks, containing usually about forty birds each, were seen on several occasions from that date until April 12, 1920. Several times they were observed within the city limits.

622.e. *Lanius ludovicianus migrans* Palmer. Migrant Shrike.

I have not yet observed it near Quebec; but it should, however, occur here (Dionne).

On May 2, 1920, I observed a pair of birds of this subspecies near Ste-Foy. They were carefully examined with binoculars from a distance of a few feet only, and were positively identified. On a few other occasions I have seen near Quebec, but at a greater distance from me, Shrikes which were probably of this subspecies, but as I was unable, under these conditions, to distinguish them with certainty from the Northern Shrike, which I have identified here several times, I did not record them.

626. *Vireosylva philadelphica* (Cass.). Philadelphia Vireo.

Mr. Dionne gave no record of the occurrence of this species nearer to Quebec than Tadousac, where it was observed by Dr. Dwight. In 1919 and 1920 I found it to be a not common breeding bird in the immediate vicinity of Quebec.

629. *Lanivireo solitarius solitarius* (Wils.). Blueheaded Vireo.

Up to the present time I have seen but four specimens of it, which I killed in the woods to the north of Quebec, one of them at Cap Tourmente near St-Joachim (Dionne).

In the vicinity of Quebec I have observed one individual of this species on each of the following dates: May 18, 1919; May 20, 1919; June 30, 1919; May 18, 1920.

636. *Mniotilta varia* (Linn.). Black and white Warbler.

It is hardly common in the vicinity of Quebec, although some are seen each year in spring and autumn (Dionne).

In 1919 and 1920 I found this Warbler to be a common migrant in spring and fall and an uncommon summer resident near Quebec.

645. *Vermivora rubricapilla rubricapilla* (Wils.). Nashville Warbler.

It is uncommon about Quebec; I have seen so far but two individuals, killed in July, 1878 (Dionne).

This species was found in 1919 and 1920 to be a regular, uncommon summer resident, locally tolerably common in the vicinity of Quebec.

647. *Vermivora peregrina* (Wils.). Tennessee Warbler.

I have seen it but once in the woods about Quebec, toward the end of May, 1886, and, in a flock of seven individuals, of which five were killed, there was but a single female (Dionne).

In 1919, I observed this species near Quebec from May 19 to July 5, and in 1920 from May 21 to July 17. In those years it was a not common or a tolerably common spring migrant and a rare summer resident. Probably it occurs in the fall also, but so far I have not recorded it here at that season.

650. *Dendroica tigrina* (Gmel.). Cape May Warbler.

I have not been able so far to obtain more than three specimens, two of which were killed near Quebec in 1878, and the other one much further north some years later (Dionne).

Mr. Dionne has since recorded this Warbler's unusual abundance near Quebec in the spring of 1912. ('The Auk,' Vol. XXIX, No. 4, p. 545, Oct., 1912.)

In 1919 I observed at least five different males of this species, the first on May 22, the last on June 1. In 1920, I observed seven males of the species, the first on May 19, the last on May 30. All of these records were obtained near Quebec. I have no records of females and no fall records.

655. *Dendroica coronata* (Linn.). Myrtle Warbler.

This species, which travels in small flocks during its migrations, arrives here very early in the spring, and afterward disappears, to go further north to nest (Dionne).

In 1919 and 1920 a few of this species remained near Quebec during the entire summer each year, and probably nested there.

660. *Dendroica castanea* (Wils.). Bay-breasted Warbler.

It is rare about Quebec; up to the present I have seen but five specimens (Dionne).

The following summary contains my observations of this species in the immediate vicinity of Quebec in 1919 and 1920: May 24, 1919 (one); May 26 (one); June 1 (one); June 3 (one); August 23 (two); May 23, 1920 (one); May 24 (one); May 28 (one); May 29 (two); May 30 (two); May 31 (one); July 1 (two); July 12 (one); September 15 (one).

661. *Dendroica striata* (Forst.). Black-poll Warbler.

I killed five, one day in autumn, about fifteen years ago, and I have seen some on some occasions since, but very rarely (Dionne).

In 1919, I observed this species near Quebec on five different days, first on May 30 and last on June 6, the total number of individuals noted being

not less than six. In 1920, I observed it in the same region in spring on seven different days, first on May 27 and last on June 4. It was then tolerably common for a time, eleven individuals being recorded on June 3. The only fall records which I have for this warbler at Quebec are: September 9, 1920 (two); September 11 (one); September 23 (two).

662. *Dendroica fusca* (Mull.). Blackburnian Warbler.

This beautiful warbler is not common in our woods about Quebec (Dionne).

This species was common in 1919 and tolerably common in 1920 as a summer resident in the vicinity of Quebec.

679. *Oporonis philadelphia* (Wils.). Mourning Warbler.

Occurs accidentally at Montreal and at Quebec (Dionne).

The Mourning Warbler was a not common summer resident near Quebec in 1919 and 1920. In the course of a three-mile walk on June 3, 1919, in the immediate vicinity of Quebec, I observed eight males of this species, and during a similar walk on June 13, 1919, I observed seven.

686. *Wilsonia canadensis* (Linn.). Canadian Warbler.

This species is usually uncommon (Dionne).

The Canadian Warbler was a common summer resident about Quebec in 1919 and was tolerably common in 1920.

721. *Troglodytes aedon aedon* (Vieill.). House Wren.

In the first part of July, 1880, I captured a female which had just made its nest in a hole in one of the corners of a small arbor in the garden of the Quebec Seminary, which is the only time that I have seen it here (Dionne).

As a summer resident about Quebec this bird was recorded by me as rare in 1919 and as uncommon in 1920. Probably "uncommon" would more correctly represent its status in 1919. Two or three pairs spend the summer on the cliffs bordering the St. Lawrence just below Merici Convent, and a number of other pairs are scattered through the suburban districts each summer.

751. *Polioptila caerulea caerulea* (Linn.). Blue-gray Gnatcatcher.

This species was not included by Mr. Dionne in his book because, when that book was written, there was no record acceptable to him of its occurrence in the Province of Quebec. One stray individual was observed by me within the limits of Quebec City on May 18, 1920. (See 'The Auk,' Vol. XXXVII, No. 3, pp. 464-465, July, 1920.)

757. *Hylocichla aliciae aliciae* (Baird). Gray-cheeked Thrush.

Mr. Dionne does not speak of any occurrence of this Thrush near Quebec City.

The only positive identification of it here which I have obtained so far was made by me in Gomin Wood on May 21, 1920, when I watched a single individual for some time at close range with binoculars. I was able to see clearly its uniform olive upperparts and its gray lores, and to note the lack of obvious buffy on the sides of the throat and breast. The bird, although chased about a good deal by me, remained absolutely silent, whereas Olive-backed Thrushes, when they arrive at Quebec, where they are summer residents, freely utter their characteristic notes. I have twice visited in Nova Scotia the breeding haunts of *H. a. bicknelli*, which differs from this subspecies in size only, and have there seen undoubted specimens of the species and noted their peculiarities of coloration, and I am well acquainted with the Olive-backed Thrush in the field.

On two or three other occasions in late May I have seen near Quebec solitary Thrushes which were probably Gray-cheeked Thrushes, but which I was unable to approach and see well enough to make satisfactory identifications.

THE FERNS OF HATLEY, STANSTEAD COUNTY, QUEBEC, 1920.

By H. Mousley.

In my second paper on the orchids of Hatley, "THE CANADIAN FIELD-NATURALIST," Vol. XXXIV, 1920, No. 3, p. 44, I intimated that probably about forty species and varieties of ferns had been collected here in 1919, and that these would be dealt with in a separate paper. This it had been my intention to do early this year, but from one cause or another the matter has had to be postponed. This delay, which at first appeared vexatious, has really been beneficial, as it has given me another season in which to further prosecute my studies and at the same time add some new species to the list. For the benefit of those interested in ferns only, and who may not have read any of my previous papers on the birds, orchids and butterflies of the district, it seems almost necessary to again say a few words on the nature of the country surrounding Hatley. The village itself lies at an elevation of about 1,000 feet above the sea level, being backed on its eastern side by a ridge of hills rising some three hundred feet higher. The ground on the western side eventually slopes away until it reaches the level of Lake Massawippe (about 530 feet) a fine sheet of water nine miles in length, with an average breadth of about one mile. On its western shore, another ridge of hills known as the Massawippi Hills rises some 900 feet above the level of the lake. The country all round is well wooded, and there are numerous small streams most of which eventually find their way into the lake. In the deciduous woods, the prevailing trees are maple, birch, ash, elm, beech, cherry, butternut and poplar, whilst the coniferous ones consist of spruce, fir, hemlock, pine, tamarack and cedars. The geological strata for the most part consists of a fine-grained sedimentary rock, containing pyrite in some cases, whilst slightly calcareous in others, with veins of quartz appearing here and there, as well as granite. As in common with the rest of the Eastern Townships, the soils have been almost entirely formed during the glacial period, which is the most recent outstanding geological event in the history of this district. Any soils which previously existed, were apparently largely carried away by the movement of the ice, and even the solid rock was deeply eroded. On the retreat of the glacier, there was left a blanket of unconsolidated materials, composed of a heterogeneous mixture derived from both far and near, and including probably a small proportion only of old soils, together with a much larger proportion of rock, fragments ranging in size from a flour to huge boulders of a ton weight. Following the retreat of the glacier, this blanket has, until the present day, been subjected to the ordinary physiographic processes of weathering and transportation by frost, streams, etc., resulting in a decomposition of the materials, and a tendency for the smaller particles to be continually moved downhill, and deposited as alluvium, etc. While the area south-east of the Massawippi valley is underlain by somewhat calcalcareous slates slightly metamorphosed, and the area to the north-west by highly metamorphosed volcanics and sediments, these rocks, as indicated above, have had a general rather than a detailed influence on the composition of the overlying soil.

As with the butterflies and orchids, most of my collecting has been done on the western side of the village, although there are some famous localities on the eastern side, one of which contains the only known station for Braun's Holly Fern, *Polystichum Braunii*. On this side lies also Barnston Pinnacle, a rocky bluff rising almost sheer out of Baldwin's Pond for a height of 600 feet. Mount Orford (2,860 feet) to the north is another rocky locality, but both of these places are some distance from my home and have only been visited once some years ago, when ferns were not being taken into consideration. Some of the smaller Aspleniums I think ought certainly to be found in these two localities, and perhaps the Male Fern, *Thelypteris Filix-mas*. Burrough's Falls to the south, and the gorge through which the river runs at Coaticook on the east, and the shores of Lake Massawippi in places are also rocky, but even these it has been found quite impossible to so far work properly, which may account for the scarcity in my list of purely rock-loving ferns. Of the other species enumerated most of them occur in more or less profusion, but there are some that seem to call for special attention, and these I propose to deal with in the order in which they appear in the list, which is that of Gray's Manual, seventh edition, the nomenclature of which, however, has been altered in accordance with the more advanced ideas, as set forth in Mr. C. A. Weatherby's paper, "Changes in the Nomenclature of the Gray's Manual Ferns," "Rhodora," Vol. XXI, 1919, No. 250, pp. 173-179. Most botanists, I believe, are in agreement with these changes although some will not admit the priority of *Thelypteris* for the Shield Ferns, and still use the name *Dryopteris* for this family. However, as Mr. Weatherby says on page 174, "*Thelypteris* remains the earliest valid name for *Aspidium* of the Manual, and much as one regrets adding another to the numerous names this genus has already borne, it must be taken up. Rules are of no use unless conscientiously followed." It seems

to me that Mr. Weatherby is right in what he says for if ever this bugbear nomenclature is to be laid by the heels, not only in this, but in all the other sciences, personal opinions will have to be made subservient, and rules strictly adhered to. For this reason I have followed the new order of things to the letter, as laid down in Mr. Weatherby's paper.

COMMON POLYPODY, *Polypodium vulgare* L. This fern so far does not appear to be the common one it usually is in most places. Certainly several stations for it have been found, but in none of them can it be said to be anything like abundant, nor have any of its numerous varieties been noted.

NARROW-LEAVED SPLEENWORT, *Athyrium angustifolium* (Michx.) Milde. Only one station for this smooth and delicately leaved fern has been found so far. This is in the centre of a large wood which has been partially cleared, and here in somewhat of a gully which is usually wet, is *angustifolium* found in some profusion, its principal companion being the Ostrich Fern, *Pteretis nodulosa.*

CHRISTMAS FERN, *Polystichum acrostichoides* var. *Scheinitzii* (Beck) Small. In one corner of the above wood that harbours *A. angustifolium*, this variety of the Christmas Fern can be found in almost if not greater abundance than the type, the sori appearing in some cases on the tips of every pinnæ, which are toothed, and the fronds usually larger than in typical plants; no doubt due to the cutting down of the trees in this particular part of the wood, which allows the sunlight to act as a strong stimulus, thus producing plants of extra luxuriance; see "How Ferns Grow," Slosson, 1906, pp. 88-89.

BRAUN'S HOLLY FERN, *Polystichum Braunii* (Spenner) Fee. This handsome and uncommon fern with its long chaffy stalks has only been found in one locality known as the Gulf on the east side of the village. Here during the present season I counted over thirty plants. The time is probably not far distant when misfortune may overtake this species in the shape of being ushered into a new genus, when it will be known as *Aetopteron Braunii* (Spenner) comb. nov. See "American Fern Journal," Vol. X, 1920, pp. 88-89. Will finality in nomenclatural matters be ever reached?

BROAD BEECH FERN, *Thelypteris hexagonoptera* (Michx.), n. comb. The Broad Beech Fern is apparently rare here, as I have only come across a very few examples so far, and these mostly small ones. With regard to the difficulty sometimes experienced in determining this species from the Long Beech Fern, *Thelypteris Phegopteris*, I would here like to draw attention to an article by Mr. C. A. Weatherby entitled, "A Neglected Character in the Beech Ferns," which appeared in the "American Fern Journal," Vol. IX, 1919, No. 4, pp. 121-122, in which the author points out how the difference in the shape, size and coloring of the scales, which in both species are borne along the main mid-rib on the under side of the fronds, forms an almost certain index to the species. I have found this hitherto neglected character most useful in determining my specimens. Another character in the Beech Ferns is described by Mr. E. H. Clarkson in "The American Fern Journal," Vol. X, 1920, No. 2, p. 60. Here it is pointed out that when the fronds of the Long Beech Fern die down in the autumn the coiled tops of the next year's croziers may be seen protruding a little above the ground. This is never the case with the Broad Beech Fern whose croziers do not appear in the fall nor yet in very early spring. Fine fresh green fronds of it, however, can be found in September when *Phegopteris* is of a dull olive colour and no new fronds whatever are to be seen. In this country one can hardly walk in some of the woods without treading the Beech and Oak Fern, *Thelypteris Dryopteris*, under foot, and yet if I remember rightly neither of them are common in England, at all events I can only call to mind having once seen them at Bolton Abbey, in Yorkshire, and there only in one particular wood. The order in which the Beech Ferns appear in my list is different to that of the Manual, and has been made necessary by the new classification as set forth in Mr. Weatherby's paper. See page 176.

THE MARGINAL SHIELD FERN, *Thelypteris marginalis* (L.) Nieuwl. This is a well distributed fern but more abundant in some localities than others. Probably the Gulf already referred to is the best station for it, and here I have found a few examples of the var. *elegans*, J. Robinson, a handsome form with larger fronds and lobed or toothed pinnules.

GOLDIE'S FERN, *Thelypteris Goldiana* (Hook) Nieuwl. l.c. This large and very handsome species is what may be termed one of the rarer or more exclusive ferns, and I only know of two stations for it, one in the Gulf, and the other in the same wood where *A. angustifolium* is found. Only a very few plants occur at either place.

BOOT'S SHIELD FERN, *Thelyteris Boottii* (Tuckerm.) Nieuwl. Hardly sufficient time has yet been given to this species to express any very decided opinion, as to its rarity or otherwise. I am inclined to think, however, that it is fairly well distributed.

CLINTON'S WOOD FERN, *Thelyteris cristata* var. *Clintoniana* (D. C. Eaton), n. comb. The same remark applies equally well to this species as to Goldie's Fern, both being found in the same localities and in about equal limited numbers.

SPREADING WOOD FERN, *Thelypteris spinulosa* var. *americana* (Fisch.), n. comb. This form of the Spinulose Wood Fern appears to be by no means rare, and can be found, I think, in most of the large woods. The type and various varieties, however,

such as *Boottii*, *intermedium* and *americana* (the latter formerly known as *dilatatum*) are by no means always easy to determine, and more time will have to be spent on them before any very definite opinion can be expressed as to their distribution.

BULBLET BLADDER FERN, *Cystopteris bulbifera* (L.) Bernh. It seems strange to have to speak of a fern as a nuisance, but that is what this species really is at times. It abounds everywhere not only on the rocks, but in the woods as well. I remember once visiting Burrough's Falls in the hope of finding some of the smaller rock ferns. I soon gave up the search as the rocks were simply smothered with this species, and it would have been impossble to detect any of the small Aspleniums with such a blanket over them. The Fragile Bladder Fern, *Cystopteris fragilis*, is not nearly so abundant and can really be said to be rare in comparison with the Bulblet.

SMOOTH WOODSIA, *Woodsia glabella*, R. Br. This rare and delicate little fern I look upon as one of my best finds. The only locality for it is situated on the eastern shore of Lake Massawippi, between the railway station of that name and Perkin's Point. I first found it on May 24 of this year (1920) almost at the foot of a rocky railway slope and I am pleased to say there was quite a little colony of it, all the plants I examined being heavily fruited.

OSTRICH FERN, *Pteretis nodulosa* (Michx.) Nieuwl. Of the large ferns this in my opinion is the handsomest, although the great Osmundas run it very close. The reason for its masquerading under the names *Pteretis nodulosa* and not *Onoclea Struthiopteris* as heretofore ,will be found fully explained in Mr. Weatherby's paper already referred to.

ROYAL FERN, *Osmunda regalis* L., var. *spectabilis* (Willd.) Gray. Seeing that the American Royal Fern differs from the European in the shape of its pinnules it has been thought desirable to make it a geographic variety, hence the var. *spectabilis*, see Weatherby as above.

CINNAMON FERN, *Osmunda cinnamomea* L. Possibly of the three Osmundas this is the most widely distributed. On August 22, 1919, I came across a peculiar frond growing apparently from a root of *Osmunda Claytoniana*, which I gathered and pressed, there being only this one example. From the disposition of the pinnules I took it to be var. *dubia* Grout. On September 7, 1920, however, I came across another similar frond very near the same spot, which clearly belonged to *O. cinnamomea*. This caused me to more carefully examine the previous frond at the base of some of whose pinnæ, by means of a magnifying glass, I found the little woolly tufts, thereby clearly establishing its identity as *cinnamomea*. I also found where I had gathered it the year previous that there was a root of *cinnamomea* and *Claytoniana* growing almost interlocked, and as there were several fronds of the latter and only this one of the former I had taken it as belonging to *Claytoniana*. The pinnae of these fronds are placed far apart on the rachis the upper ones being from 2.5 to 3.5 cm., and the lower ones 4 cm. apart. The pinnules which are somewhat toothed or lobed are also from 5 to 10 mm. apart which gives the whole frond a very light and open appearance. As far as I can gather there is no name for this variety, or may it be a cross between these two Osmundas?

ADDER'S TONGUE FERN, *Ophioglossum vulgatum* L. As it is proposed to make the family Ophioglossaceae the subject of a further paper, at some future time, I only propose in the present instance to deal very briefly with each species. The present one I find in the damp hollows of almost every mowing field, as well as on the dry knolls of some of the upland pastures. In the latter situations, environment plays an important part in the growth of the species, many of the plants only attaining a height of from 3 to 9 cm., whereas those growing in the damper situations run from 20 to 33 cm.

MOONWORT, *Botrychium Lunaria* (L.) Sw. This rare little fern was only discovered in June of the present year (1920) in two localities, in one of which only one plant was found, and about half a dozen in the other. These latter seem referable to the form known as *onondagense* Underw.

MATRICARY GRAPE FERN, *Botrychium ramosum* (Roth.) Aschers. In 1919 this species was particularly abundant in one station on sloping ground under cedars, but this year comparatively few plants could be found, although at another new station, also on sloping ground, but under deciduous trees, quite a number could have been gathered.

COMMON GRAPE FERN, *Botrychium obliquum* Mulh. This species and the var. *dissectum* Spreng, I had the gratification of adding to the list of Quebec ferns on December 21, 1918, as recorded in "THE CANADIAN FIELD-NATURALIST," Vol. XXXIII, 1919, No. 5, p. 97. At that time only one example of each was found, and nothing was known of their distribution. Now, however, I am able to state that both are abundantly distributed, *obliquum* being much the commoner of the two.

TERNATE GRAPE FERN, *Botrychium ternatum* (Thunb.) Sw., var. *intermedium* D. C. Eaton. This is another well distributed species, but not nearly so plentiful as *obliquum*.

RATTLESNAKE FERN, *Botrychium virginianum* (L.) Sw. There is hardly a wood in which this species is not more or less abundant, the plants ranging in height from 8 to 60 cm.

It may here be of interest to mention, that of the forty-one species and varieties enumerated, all have

been gathered within an area of four square miles, which area could still further be reduced to three square miles if we except *Woodsia glabella*. In the United States a friendly rivalry exists as to which State holds the record for the best fern localities. At present the State of Vermont which adjoins our County of Stanstead claims premier honors (the same as it does for the orchids,) having three localities, Willoughby Lake, Dorset and Manchester where thirty-five, and Pittsford, where thirty-four true species of ferns have been collected. In view of this it has recently been said that apparently only Vermont can compete effectively with Vermont, a statement which I hope ere long to refute, seeing that my list of true ferns for Hatley now stands at twenty-eight species, and this for only two years work, whereas most, if not all, of the above lists have been in the making for over twenty years. It seems strange in view of Gosse's diversified love of natural history subjects, he should have entirely ignored the ferns, for we find no mention whatever of them in his "*The Canadian Naturalist*," 1840, written whilst residing in these parts from 1835-38.

In conclusion, my best thanks are due to Mr. William R. Maxon, who after the death of Mr. James M. Macoun, kindly undertook to verify my determinations, and who in many other ways has given me much valuable help and assistance which has greatly facilitated the writing of this paper. To Dr. Harvie I am indebted for the information regarding the geological formation of this district, and for naming samples of rock submitted.

LIST OF THE FERNS OF HATLEY, 1920.

POLYPODIACEÆ.

Polypodium vulgare L. Common Polypody.

Adiantum pedatum L. Maidenhair.

Pteridium latiusculum (Desv.) Maxon. Common Brake, Bracken.

Athyrium angustifolium (Michx.) Milde. Narrow-leaved Spleenwort.

Athyrium acrostichoides (Sw.) Diels. Silvery Spleenwort.

Athyrium angustum (Willd.) Presl. Lady Fern.

Polystichum acrostichoides (Michx.) Schott. Christmas Fern.

Polystichum acrostichoides var. *Scheinitzii* (Beck) Small (var. *incisum* Gray).

Polystichum Braunii (Spenner) Fee. Braun's Holly Fern.

Thelypteris palustris Schott. Marsh Fern.

Thelypteris noveboracensis (L.) Nieuwl. l.c. New York Fern.

Thelypteris Phegopteris (L.) Slosson. Long Beech Fern.

Thelypteris hexagonoptera (Michx.), n. comb. Broad Beech Fern.

Thelypteris Dryopteris (L.) Slosson. Oak Fern.

Thelypteris marginalis (L.) Nieuwl. l.c. Marginal Shield Fern.

Thelypteris marginalis var. *elegans* J. Robinson.

Thelypteris Goldiana (Hook.) Nieuwl. l.c. Goldie's Fern.

Thelypteris Boottii (Tuckerm.) Nieuwl. Boot's Shield Fern.

Thelypteris cristata (L.) Nieuwl. l.c. Crested Shield Fern.

Thelypteris cristata, var. *Clintoniana* (D. C. Eaton), n. comb. Clinton's Wood Fern.

Thelypteris spinulosa, var. *intermedia* (Muhl.), n. comb. Spinulose Wood Fern.

Thelypteris spinulosa, var. *americana* (Fisch.), n. comb. Spreading Wood Fern.

Cystopteris bulbifera (L.) Bernh. Bulblet Bladder Fern.

Cystopteris fragilis (L.) Bernh. Fragile Bladder Fern.

Woodsia glabella R. Br. Smooth Woodsia.

Dennstaedtia punctilobula (Michx.) Moore. Hay-scented Fern.

Onoclea sensibilis L. Sensitive Fern.

Onoclea sensibilis var. *obtusilobata* (Schkuhr.) Torr.

Pteretis nodulosa (Michx.) Nieuwl. Ostrich Fern.

OSMUNDACEÆ.

Osmunda regalis L., var. *spectabilis* (Willd.) Gray. Royal Fern.

Osmunda Claytoniana L. Interrupted Fern.

Osmunda cinnamomea L. Cinnamon Fern.

OPHIOGLOSSACEÆ.

Ophioglossum vulgatum L. Adder's tongue.

Botrychium Lunaria (L.) Sw. Moonwort.

Botrychium ramosum (Roth.) Aschers. Matricary Grape Fern.

Botrychium obliquum Muhl. Common Grape Fern.

Botrychium obliquum var. *elongatum* Gilbert & Haberer.

Botrychium obliquum var. *dissectum* (Spreng) Clute. Feathery Grape Fern.

Botrychium obliquum var. *oneidense* (Gilbert) Waters.

Batrychium ternatum (Thunb.) Sw., var. *intermedium* D. C. Eaton. Ternate Grape Fern.

Botrychium virginianum (L.) Sw. Rattlesnake Fern.

THE CANADIAN FIELD-NATURALIST

VOL. XXXIV. OTTAWA, ONT., NOVEMBER, 1920. No. 8.

THE VERTEBRATES OF THE OTTER LAKE REGION, DORSET, ONTARIO.

By A. H. Wright and S. E. R. Simpson.

I.—GENERAL ACCOUNT.

By A. H. Wright.

The district covered by these notes might well be termed the Lake of Bays region. More strictly they pertain to the extreme eastern part of Muskoka from the longitude of Portage (between Peninsula Lake and Lake of Bays) to that of Hollow lake (Lake Kawagama, or Kahweambelewgamat or Kahweamhegewagamag) in northwestern Haliburton. In latitude they relate of the region from Dorset on Trading lake (the eastern end of Lake of Bays navigation) northward to Algonquin Park Station in southwestern Nipissing. The center of activity is at Camp Otter (Professor C. V. P. Young, Cornell '99, Director) on Otter lake which is two miles north of Dorset. The waters and woodlands of the above roughly outlined district are more or less traversed each summer by councillors of this camp.

Camp Otter is now in its eleventh season. From its beginning Prof. and Mrs. C. V. P. Young, its directors, have been interested in various phases of animal and plant life. Early associated with them were Dr. and Mrs. S. A. Munford and later Dr. and Mrs. Abram T. Kerr, of Ithaca, N.Y. Besides those who have encouraged the study of natural history in this region, have been several students or associates of the senior author. Some of these resident naturalists have been Prof. Asa C. Chandler, Mr. Frank M. Kilburn, Prof. E. L. Palmer, Mr. G. M. O'Connell (several seasons), Dr. H. G. Bull, Mr. D. C. Gamble and Mr. S. E. R. Simpson. We have added some observations of Mrs. Julia Moesel Haber (Prof. of Zoology in Elmira College, Elmira, N.Y.) for Fox Point (1911). Several summers Mr. L. A. Fuertes, the bird artist, has spent varying periods in the camp.

These lists are presented with the idea of starting a permanent catalogue of animal and plant forms of the region.

Otter Lake is distinctly in the Canadian life zone. The coniferous evergreens are: larch, black spruce, balsam fir, arbor vitae, hemlock, white and red pines, and common juniper *(Juniperus communis)*. Back of camp in the deeper woods or undisturbed areas occur plenty of yellow and paper birches, sugar maples, mountain ash with undergrowth of mountain and striped maples, hobblebush, beaked hazel nut and hoary alder *(A. incana)*. In the more open places are quaking aspen, large toothed poplar and some balsam poplar.

Along the road southward to Dorset and Lake of Bays where sparse settlement begins, occur a few basswood, American elm, white ash, black birch, staghorn sumac, scarlet oak, choke cherry, alternate-leaved dogwood, thorn apple *(Crataegus sp.)*, and *(Diervilla Lonicera)*, unmistakable signs of the Transition Zone. No black walnuts, butternuts, nor hickories were recorded. On Rock Island of Otter lake and along some roads occur red oak, wild red cherry, june berry, Bebb's willow.

Along the road to Hardwood lake and at Hardwood lake a similar element we have, in some beeches among many maples and birches, plenty of wild black and red cherries, staghorn sumac, black elders, alternate-leaved dogwood and white ash.

Around or in peat bogs occur: leather leaf, bog rosemary, withe rod *(Viburnum cassinoides)*, blueberries *(Vaccinium pennsylvanicum, V. p. nigrum, V. canadense)*, black alder *(Ilex verticillata)*, skunk currant *(Ribes prostratum)* and mountain holly *(Nemopanthus mucronata)* the last being rare.

Around some of the lakes or in swampy edges were found sweet gale *(Myrica Gale)* red berried elder, glaucous willow, shining willow, meadow sweet and black ash.

Other trees and shrubs which proved uncommon about camp were red-osier dogwood, sheep laurel *(Kalmia angustifolia)*, American fly honeysuckle, hop hornbean *(Ostrya virginiana)*.

The herbaceous flora reveals a strong Canadian cast. Around the camp site are twin-flower *(Linnaea borealis)*, dwarf cornel *(C. canadensis)*, common wood sorrel *(Oxalis acetosella)*, pale corydalis *(Corydalis sempervirens)*, bristly sarsaparilla,

(Aralia hispida), enchanter's nightshade *(Circaea alpina)*, yellow Clintonia *(Clintonia borealis)*, painted trillium *(Trillium undulatum)*, large coral root *(Corallorhiza maculata)*, shin-leafs *(Pyrola elliptica, P. cholorantha, P. minor)*, false-lily of valley, *(Maianthemum canadense)* and twisted stalk *(Streptopus)*.

In and around the peat bog were *(Cypripedium acaule)* both normal pink, and albino yellow-petalled specimens, small greenwood orchis *(Habenaria clavellata)*, small northern bog orchis *(H. obtusata)*, rattlesnake plantain *(Epipactis pubescens)*, nodding ladies' tresses *(Spiranthes cernua)*, multitudes of grass pink *(Calopogon pulchellus)* and rose pogonia *(Pogonia ophioglossoides)*, goldthread *(Coptis trifolia)*, creeping snow-berry *(Chiogenes hispudula)*, dwarf raspberry *(Rubus triflorus)*, Dalibarda *(D. repens)*, both cranberries, three-leaved Solomon's seal *(Smilacina trifolia)*, arbutus *(E. repens)*, masses of horned bladderwort *(Utricularia cornuta)*, lance-leaved violet *(Viola lanceolata)*, naked bishop's cap *(Mitella nuda)*, Indian cucumber-root *(Medeola virginiana)* and *Aster junceus*, spatulate and round-leaved sundews *(Drosera intermedia* and *D. rotundifolia)*, and Canadian and marsh St. John's wort *(Hypericum canadense, Triadenum virginicum)*.

On the more open hillside opposite camp and toward Dorset were narrow-leaved gentians *(Gentiana linearis)* and the northern bed straw *(Galium boreale)*.

The mammals are decidedly of Canadian affinity, but with the rare appearance of wildcat, raccoon, black squirrel, transition zone influences enter.

In the birds more transitional forms appear rarely or sparingly, toward Dorset, southward and westward to wit: towhee, woodthrush, yellow-throated vireo, Baltimore oriole, catbird, whippoorwill, least flycatcher, indigobird, yellow warbler, parula warbler, red-headed woodpecker, Maryland yellow-throat.

Thus in trees, herbaceous under-cover, birds and mammals there is close agreement in the preponderance of Canadian forms. At Otter Lake and northward, the incursion of the transition element is not so pronounced as at Huntsville, where railroad and other civilized encroachments play a greater role. The ride from Huntsville to Dorset and thence by foot to Otter lake emphasizes this difference to the trained observer.

To such as might wish to know what ferns we casually observed the list is:

Woodsia Ilvensis
Osmunda Claytoniana
Onoclea sensibilis
Osmunda cinnanomea
Osmunda regalis
Dicksonia punctilobula
Polystichum acrostichoides
Aspidium noveboracense
Aspidium cristatum
Aspidium marginalis
Asplenium Filix-femina
Pteris aquilina
Polypodium vulgare
Phegopteris polypodioides
Phegopteris hexagonoptera
Phegopteris Dryopteris.

II.—THE FISH.

By A. H. WRIGHT.

The present list of sixteen species reveals the scanty variety of the Highlands of Ontario. Several of these are introduced species. Others are stock introduced to replenish the supply of the waning species in this series of lakes which are two hundred or more feet higher than the Muskoka group. The decided barriers do not permit incursions from the great variety of the Great Lakes. The region, however, abounds in individuals of the few game species it possesses. For comparison, we have employed Meek's[1] results in the Highlands of Ontario. He began at Hawkestone and Orillia on Lake Simcoe and followed the Grand Trunk railroad through Gravenhurst (Muskoka lakes) to Trout Creek and North Bay (Lake Nipissing). All the way northward the railroad bears away from Georgian bay and the stations he successively came to were successively farther away from it in barriers, etc. Lake Simcoe and the Muskoka lakes are much nearer Georgian bay and Lake Ontario than Lake of Bays or Otter lake. Hence the Great Lakes' complexion of Lake Simcoe with silversided minnow *(N. atherinoides)*, log perch *(Percina caprodes zebra)*, spot-tailed minnow *(Notropis hudsonius)*, silvery minnow *(Hybognathus nuchalis)*, trout-perch *(Percopsis omiscomaycus)* and long-nosed dace *(Rhinichthys cataractae)*, or Moon river just below Muskoka lake (Bala) with log perch, spot-tail minnow and silvery minnow. Such species are never to be expected in Otter lake unless introduced or unless it was geologically connected with the Great Lakes. Otter Lake seems more comparable to Trout Creek. The former has sucker, horned dace, red-bellied dace, fathead, Cope's minnow, shiner, brook trout, pumpkin seed; the latter has suckers, horned dace, red-bellied dace, fathead, blunthead, shiner, brook trout, brook stickleback, nine-spined stickleback and pumpkin seed,

(1) Meek, S. E. Field Columbian Museum Zoological Series, Volume I., No. 17., Publ. 41, November, 1899, pp. 307-311 and Volume III., No. 7, Publ. 67, July, 1902, pp. 131-140.

and in the blunthead and nine-spined stickleback shows slightly greatly affinity to the Great Lakes than Otter Lake. Most previous lists for Ontario[2] although of some help related too much to the ichthyologist's boundary paradises and reservoirs, namely: Lakes Ontario, Erie, Huron and Superior, to be of particular service in the study of the far inland lakes of the province.

Ameiurus nebulosus (Le Sueur). Catfish.

Common in the weedy edges of Otter lake where pickerel-weed, pipe-wort, watershield and other water plants abound. Also found in outlet of the Peat bog. We found no catfish in Fletcher lake.

Catostomus commersonii (Lacepede). Sucker.

Reported as common throughout the region. I secured it at Otter lake. Meek secured it at Gravenhurst and Trout creek.

Chrosomus erythrogaster Rafinesque. Red-bellied Dace.

The most common minnow of all these lakes. It is especially a minnow of quiet clear water, both lakes and streams. Every lake or pond visited if it had minnows at all harbored mainly red-bellied dace. Meek secured it at Muskoka lake and Trout creek. Also taken by Professor Macoun in Algonquin Park.

Pimephales promelas Rafinesque. Fat-head.

On August 11, 1913, we seined several "fat-heads" in a marshy place of Otter lake. Meek secured it at Trout Creek.

Notropis cayuga Meek. Cayuga Minnow.

In weedy shallows of Otter lake and its peat bog pond we found this species. I believe this the same as Meek's *N. muskoka* taken by him at Gravenhurst and other places.

Notropis cornutus (Mitchill). Shiner.

The shiner or redfin occurs in many of the lakes of the region. Taken by us in Otter, Harvey Jr., and other lakes.

Semotilus atromaculatus (Mitchill). Horned Dact. Creek Chub.

Widely distributed. It was found in Otter, Harvey Jr., Fletcher and other lakes. Meek had it from Gravenhurst and Trout Creek.

Leuciscus neogaeus (Cope). Cope's Minnow.

In weedy shallows of Otter Lake, we secured representatives of this form on July 29 and August 11, 1913, associated with red-bellied dace.

Esox lucius (Linnaeus). Pike.

So far as we could determine there are no native pike *(E. lucius)*, pickerel *(E. tridecemlineatus)* and lunge *(E. masquinongy)* in Lake of Bays, Hollow Lake, Fletcher Lake and other lakes of this region, and no one was found to report introduced fish of these three species. Meek reports the pike and lunge from Muskoka Lake.

Eupomotis gibbosus (Linnaeus). "Pumpkin Seed."

Common from Lake of Bays to Algonquin Park. The boys of camp brought us sunfish from Harvey Jr., Hardwood, Fletcher and other lakes and they were not uncommon in Otter Lake. Rock bass are not in these lakes but held by local fishermen to be in lower lakes although Meek stated there were no rock bass in the lakes of the Highlands of Ontario.

Micropterus dolomieu Lacepede. Small-mouthed Black Bass.

Not reported from Lake of Bays eastward or northward. Meek secured it on Muskoka Lake.

Perca flavescens (Mitchill). Perch.

Taken in several lakes in 1913. Common in Fletcher, Skin and Porridge lakes, but not very large. Held to be put in these lakes by the Dominion government twenty or more years before. The stock is supposed to have come from Orillia. Also taken in Lake of Bays. Meek secured them at Gravenhurst.

Cristivomer namaycush (Walbaum).

Common in many of the lakes of the region. Held by many residents to be native of Hollow, Kimball, Bear and some other lakes. In others like Hardwood they were held to be introduced about June, 1889. About Hollow Lake, Lake of Bays, and other lakes of the region they allude to larger gray trout with white flesh and smaller salmon trout with reddish flesh.

Salvelinus fontinalis (Mitchill.) "Speckled Trout." Brook Trout.

Common in lakes of the region. Taken in Otter, Fletcher and Harvey lakes and others more remote.

Coregonus clupeiformis (Mitchill). Whitefish.

We saw no whitefish. One informant said there was a whitefish caught in the shallows of Hollow lake during the fall and winter. Others state that there is a whitefish in Lake of Bays. Whether these are true whitefishes or ciscos remains to be discovered. Some of the rangers assert there are whitefish lower down at Orillia, Peterboro, etc., but not here.

Lota maculosa (LeSueur). Ling.

This species is reported as very common in Lake of Bays, and Hollow lake where they are caught on night lines.

III.—THE BATRACHIANS AND THE REPTILES.

By A. H. WRIGHT and S. E. R. SIMPSON.

The Salamanders.

Nash (1908) gives ten species of salamanders

(2) Nash, C. W., Checklist of the Fish of Ontario. Dept. of Education, Toronto, 1908. Also, "Fishes of Toronto" in "The Natural History of Toronto Region, Ontario, Canada, pp. 249-371.

for Ontario; Piersol (1913) seven for the Toronto region; and Patch (1918) six from Ottawa. Our list should include *Ambystoma maculatum, Eurycea bislineata, Notophthalmus v. viridescens, Ambystoma jeffersonianum,* and *Plethodon cinereus.* As yet we have recorded at Otter Lake or in its environs (within 10 miles) only the last three, the same species which Meek (1899, 1900) took in Gravenhurst or Trout Creek. Little effort has been made for their search except in the summer of 1913.

Notophthalmus v. viridescens (Rafinesque). Common Newt.

Two or three records of this form were made in the summer of 1913. It is, however, rare. Meek took one near Gravenhurst, September, 1899.

Ambystoma jeffersonianum (Green). Jefferson's Salamander.

Recorded only once in 1913 at Otter Lake. Meek and Clark (1900) secured two specimens from Trout Creek to the northward.

Plethodon cinereus (Green). Red-backed Salamander.

Rather uncommon about Otter Lake. Taken at three different times in 1913 by Messrs. C. V. P. Young and E. Bennett. All the material was of the red-backed phase. Inasmuch as these records were within the species' breeding season, all were found in rotting logs.

THE FROGS.

Bufo americanus Holbrook. American Toad.

Abundant. Between June 29-July 3, 1913, we found numerous transforming and transformed toads in the trails and roads. In August, 1919, they were found just transformed in some places. Most of the adults are much spotted below.

Hyla crucifer Wied. Spring Peeper.

Meek found this form common in September, 1899, near Gravenhurst but scarce in June 1900. It is solely a question of voice records. In 1913 lone peepers were heard from June 28-July 6. Throughout most of July they were quiet, except for a few at the very end of the month. By August 10, 1913, stray peepers began to call and from then onward into September they were not uncommonly heard. We recorded them at Lake of Bays, Gem, Hardwood, Crozier, Fletcher and Otter lakes. We took them in midsummer in the woods, in dried up swampy areas, and around the edges of the lakes.

Hyla v. versicolor Le Conte. Tree Toad.

Not commonly found during midsummer after the breeding seasons of late May-July. Heard in late June or early July (9th) in 1913. In 1919 heard occasionally throughout the summer. Sometimes in midsummer we find them amongst the moist leaves around the lakes or in swampy areas.

Rana catesbeiana Shaw. Bullfrog.

Meek found it abundant at Gravenhurst and Bala and so it is at Otter Lake. The boys of this camp frequently catch them for food. By day they often club them with a paddle or with a stick, catch them by hand or with red flannel and hook. In the last of June and early July the bullfrog chorus is quite pronounced. After the middle of July, or July 20th, a few males are heard at night. Egg laying may rarely extend to August 1, some females taken on July 25, 1913, being unspent.

Rana clamitans Latreille. Green Frog.

Meek found it very abundant at Gravenhurst and at Bala. Very common in the Otter lake region. This species normally transforms in June and July but in August 25, 1919, newly transformed specimens were found.

Rana palustris Le Conte.

Scarce. In the summer of 1913 all of our records of this species came between July 14 and 25. Then only isolated specimens were discovered.

Rana pipiens (Schreber.) Leopard Frog.

The most abundant frog of the region.

Rana septentrionalis Baird. Mink Frog.

Not uncommon in the Otter lake region. They were heard croaking from July 7-16, 1913, in a small peaty lake near Otter lake. Later on July 24, 1913 (in Ten Mile creek) between Lake of Bays and Otter lake we found them common among lily pads, also at Porridge lake, July 28, 1913 and on Fletcher lake, September 1, 1913. In 1919 in the middle and last of August sixty or more were taken with a net from the lily pads.

Rana sylvatica Le Conte. Wood Frog.

In 1913, we secured only two newly transformed specimens on July 8 and July 24, and three adults, July 25. All were lost and we are unable to identify them positively as *R. sylvatica.* It is a woodland form in midsummer, very seldom seen.

THE SNAKES.

Nash gives 17 species of snakes for Ontario. J. B. Williams finds 9 species in the Toronto region, Meek, 3 species in Muskoka country and Patch, 2 species in the vicinity of Ottawa. We have five species in our list. Three more may be later reported by subsequent writers. We found no clue to the riband snake at all. The natives described two other snakes, one apparently the milk snake *(Lampropeltis triangulum triangulum)* and another the spreading adder *(Heterodon contortrix)* from the region somewhat south of Lake of Bays.

Diadophis punctatus (Linné.) Ring-necked snake.

In the summer of 1913 we recorded six specimens of this species, mainly along the road to Dorset and on the cliff to the west of camp. In 1919 one was found in mid-August between Otter lake and Dorset.

Liopeltis vernalis (Harlan.) Green Snake.

Meek secured one at Gravenhurst and G. S. Miller, Jr., Aug. 6, 1896, saw a green snake at this same place. Several of the natives voluntarily described a "grass green snake not very common." We have not yet taken it.

Natrix sipedon sipedon (Linné.) Water Snake.

Meek took one specimen at Gravenhurst and the species is uncommon in the Lake of the Bays region. Many of the natives call it a "black snake."

Storeria occipito-maculata (Storer.) Red-bellied Snake.

This and the ring-necked snake are of about equal occurrence in the region. Through 1913 and in August, 1919 we recorded four specimens of this species.

Thamnophis sirtalis sirtalis (Linné.). Garter Snake.

Abundant; the snake of the region. On August 11, 1913 one of our captive garters gave birth to 19 young.

THE TURTLES.

Chelydra serpentina (Linné.). Snapping Turtle.

Uncommon. Found more in muddy creeks and ponds than in the open lake. We took one July 23, 1913, in Fletcher lake with a carapace length of 18-20 inches. On the road to Dorset in the last of August, 1919, another specimen was taken with head width of three inches. Sometimes called "Black-turtle" in this region.

Chrysemys marginata marginata (Agassiz.) Western Painted Turtle.

We have not seen this form in this region but the natives describe a small mud turtle other than the snapper and the description accords well with this species.

(To be continued.)

THE LARGER FRESHWATER-CRUSTACEA FROM CANADA AND ALASKA.

By FRITS JOHANSEN.

(Continued from Vol. XXXIV, page 132)

II.—ISOPODA.

This order of crustacea has a great number of representatives in the sea, some of which live parasitically on fishes, other crustacea, etc., and are correspondingly deformed, especially the females. Three families are known from freshwater on this continent.

They have the following characters in common with the amphipods; a many segmented body, no carapace, but the head and first thoracic segment united, and the eyes, when present, sessile. While the body of an amphipod is compressed that of an isopod is depressed thus making the latter a less capable swimmer, but admirably suited for dodging under stones, etc., and attaching itself to moving animals. It is true that certain of the marine forms (*Mesidothea* sp.) are good swimmers (using their legs), and live almost a pelagic life when they are very young (just after leaving the brood-pouch), but they soon change this for crawling over or burrowing in the sea bottom, the typical life for most of the isopods. The eggs are carried by the females on the underside of the body in a brood-pouch,* as in the amphipods, and the young ones also remain inside the pouch some time after hatching. The newborn young are practically like their parents though different in color and the proportional size of the various parts of the body, and the embryonal development inside the egg is said to be not quite so complete as with the amphipods. A popular name for the isopods is "sow-bugs," and it is well known that certain of them (*Oniscus*, etc.) live on land under bark or stones, etc. The marine and terrestrial forms are predacious, while those in freshwater feed upon decaying vegetable matter. Owing to their more hidden habit the freshwater forms are not quite so important an item in the food of fishes, birds, etc., though the marine or brackish water forms are decidedly so. Among the latter is the large interesting species *Mesidothea entomon*, which has a circumpolar distribution and also is found as a glacial marine relict in the large lakes of Sweden and in the Baltic. In the arctic it is a littoral form and one of the most characteristic and commonest invertebrates along the coast west of Hudson Bay. I have observed (arctic Alaska) how it will enter the estuaries of rivers or smaller water courses at high tide, remain there in quie'

*Formed by lamellae from the thoracic legs.

pools† and gradually ascend the streams so that it is even found in certain large freshwater lakes near the coast and serves as food for typical freshwater-fishes (lake-trout, etc.). It has not, however, in the arctic becomes a freshwater species to the same extent as has other crustacea, *Mysis relicta* Lovén (see Rep. Canad., Arct. Exped., 1913-18, Vol. VII, Parts B. and D.).

Of the three families of freshwater isopods occurring on this continent the one (Cirolanidae) is represented by a blind form in artesian wells and has so far only been found in the United States, and the other is that of the parasitic Bopyridae found upon higher crustacea (Decapoda). Nor has this latter yet been recorded from Canada or Alaska; the females in the genus *Probopyrus* become, after attachment to their host, peculiarly deformed and unsymmetrical while the young individuals and males are more normal in habit and appearance. There is a great number of marine forms of this family. The third family of freshwater-isopods is the Asellidae, which is represented by three genera of which one has so far only been recorded from the United States, and as with the species of the two preceding families is apparently missing from Canada and Alaska. It is found in underground caves or artesian wells. The Asellidae are distinguished from the Cirolanidae by the fact that the last pair of tail feet (uropods) are not inserted laterally on the telson so as to form a tail-fan, but at the posterior end. As mentioned above the family is represented in Canada by two genera. The first *(Mancasellus)* of these has only one species *M. tenax* Smith, in Canada and probably does not occur in Alaska. It is easily separated (see Huntsman's figures) from the one species of the other genus *Assellus communis* Say also occurring in Canada by the extended, truncate epimera (segmental processes) and by the head being much broader than long and with a deep incision on each side, characters which can be ascertained even in very young individuals. It has thus a much greater transverse diameter than has *Assellus communis* and is superficially not unlike its terrestrial relatives though lacking the latter's ability to roll itself up into a ball. It is far less abundant than *Assellus*, and seems to be still more retiring with mode of life, being mainly found under stones, etc., nor is it found in temporary pools and streams where the other is often found. Its distribution in Canada seems to be somewhat like that of *Eucrangonyx gracilis*, and limited to the Great Lakes area (Superior, Huron, Georgian Bay, Lake Ontario, upper St. Lawrence river, the Ottawa valley and southern Ontario); in the United States it has been recorded from Lake Superior to the Detroit river. Its maximum length is not quite 1½ cm. About its life-history little has been known, but I am able to give some interesting data recently acquired. Thus among the specimens sent me by Prof. E. M. Walker of Toronto and collected near Lake Simcoe, Ont., on May 30, 1917, some of the females had eggs in the brood-pouch. I secured a great number of very young (3-4 mm. long) individuals of this species under stones in a bight of the Ottawa river on July 6, 1919.

The same day I found young *Asellus communis* of a corresponding size, and could thus compare them. The young *Mancasellus* could be distinguished from the young *Asellus* not only by the characters given above (greater width, lateral incision in head, etc.), but also by a very characteristic pattern of four dark brown, longitudinal stripes upon their dorsal side quite lacking on the paler young of *Asellus*. There was some variation among the different young *Mancasellus* in the intensity and distribution of the longitudinal, dorsal stripes, but the pattern was always the same, and I found it to hold good also for the young (below 5 mm.) *Mancasellus* which I secured at Alexandria Bay, N.Y., on September 1, 1919 (see below). The full-grown *Mancasellus* I collected, also, show some traces of this pattern (the animals were dusky dorsally), so it seems to be a characteristic of the young individuals. It was interesting to note, that the average size of the young *Mancasellus* collected on July 6th was larger (3-4 mm.), than that of the young *Asellus* (3 mm.) on the same date; the broods of *Mancasellus* are probably born somewhat earlier or grow faster than is the case with *Asellus*. From observations I have made regarding the birth of the young *Asellus* and the rather slow growth of both species I can say almost with certainty, that these young ones of both species taken on July 6th are about two months old. Their habits were quite the same as those of the adults.

New records of *Mancasellus tenax* for Canada are as follows:

Several young ones (below 5 mm.) from under stones in bight canal at Alexandria Bay, Thousand Islands, N.Y., Sept. 1, 1919, (F. Johansen).

One full grown (13 mm.) male from among stones; Fairy Lake, near Hull, P.Q., May 5, 1918. (F. Johansen).

One adult, Fairy Lake, P.Q., April 25, 1920, (F. Johansen).

Many specimens (various sizes) from Bridgman's Creek, Chelsea Road, Hull, P.Q., May 9, 1920, (F. Johansen).

One adult (about 12 mm.) and many young (3-4 mm. ones from underside of stones; bight in

†Perhaps for breeding purposes (See C.A.E. report).

Ottawa river, Hull Park, P.Q., July 6, 1919, see above, (F. Johansen).

A dozen adults (about 12-14 mm. some of the females with eggs in broodpouch), from upper part of Wilson's Creek, De Grassi Point, Lake Simcoe, Ont., May 30, 1917, (E. M. Walker).

It is greatly to be desired that additional data concerning the distribution of this conspicuous and interesting species should be secured from localities north, east and west of the present records.

Far more common than *Mancasellus tenax* is the other species of freshwater isopod, *Asellus communis* Say. It has been known from Georgian Bay and Toronto, Ont., and in the United States from Massachusetts to Michigan. It will be seen from the new records given below that it has a much wider distribution in Canada than formerly known, though we have no definite records of it from the Maritime* and the western provinces. Nothing is known about its northern limit on this continent, except that it is very common around Ottawa, both on the Ontario and Quebec side. Its distribution is probably very much the same as that of *Hyalella knickerbockeri*, which means that it may occur in southern Alaska, but that it probably does not approach the barren grounds of this continent†. To a still larger extent than *Hyalella*, and in the same way as *Mancasellus* it appears to be a woodland species, and is therefore perhaps not found on the plains of the Canadian west. Where it occurs it is very common, and is found in great numbers both in rivers and large lakes and also in ponds and temporary pools and streams, both on clean bottom and also among much vegetation, dead leaves, etc.

In northern Europe this genus is represented by a closely allied species the well-known *Asellus aquaticus* Linn., which has been recorded by Packard from Labrador and may occur in Newfoundland. Not much has been recorded hitherto regarding the development (life-history) of *Asellus communis*. I am, therefore, glad to be able to add some original observations which I have made recently during my collecting trips to various localities in Canada. On April 20, 1919, I collected in a pool stream in swamp at Deschènes, P.Q., near Ottawa, some females, 1 cm. long, which had many white eggs in the broodpouch,‡ as well as some males, 1½ cm. long. These crustacea were placed in a jar for rearing, and two weeks later young ones that emerged were noticed. These latter were carried in the broodpouch of the mother-animal as late as May 6, (until the end of May in 1920), moving freely around inside their cage, and when the mother-animal was touched some of the young ones would emerge and swim or crawl around.** These new born *Asellus communis* are from 1 to 1½ mm. long; they have practically the appearance of their parents (well-developed appendages, etc.), though the head is rounded and of the same width as the succeeding segments and the terminal plate (telson) correspondingly large. In color they were pale white, with dark eyes and the brownish intestinal canal and pale-pink "gills" (abdominal feet) shining through the cuticula. While sinking to the bottom or crawling over the latter the antennae, legs and "gills" move continuously, each kind of appendage performing its particular function (feeling, crawling, respiration). I kept these young isopods for several months and could easily have kept them longer, if I had had time to continue my observations. The energy with which they crawled around looking for food or sought to escape when I tried to catch them was certainly wonderful, all the appendages going in one whirl and the body twisting as well. When about a month old they were not much larger (about 2 mm.) than when first born; they were now becoming brownish. I preserved samples of them (June 2). It will thus be seen, that the first brood of the summer is born in the beginning of May (near Ottawa), and that their growth is rather slow. It is interesting to note that even egg (brood)-carrying females of this species are considerably shorter than the males (maximum size of females noticed 1 cm.), sometimes even only half the size (8 mm.), of the maximum size of the latter ones. Females secured at Gatineau Point, P.Q., near Ottawa on June 14, 1919, had the brood pouches empty; on the other hand females secured on July 6, 1919, in Hull Park, P.Q., had the eggs (second summer-brood) in the brood pouch. The same day (July 6) and place I secured also as has already been mentioned a 3 mm. long young *Asellus communis*, probably of the first summer-brood and now about two months old. It had already the grayish dorsal color of the full grown females (the color of the latter ones is less "spotted" and brown than that of the males), and could thus by its color alone be easily distinguished from the young *Mancasellus* of a corresponding (1 mm. larger) size also found on this date. Other female *Asellus communis* secured at Alexandria Bay, Thousand Islands, N.Y., on September 1st, 1919, had also eggs in the brood pouch, thus carrying what would probably be the third brood of the summer. Females from a pool near a quarry outside of Hull city, P.Q., collected on

*See additional notes.

†I found neither it nor Mancasellus along the arctic coast of Alaska and western Canada.

‡In 1920 the females first carried eggs in the beginning of May.

**I have observed the same in the case of Mesidothea entomon in the arctic.

October 5th, 1919, had unripe eggs in the brood pouch.

New records from Canada which I have for this isopod are:

Many specimens (about 5 mm. long and less) from stream pools at foot of Diamond Hill, Quebec City, September 19, 1919, (F. Johansen).

Many specimens (up to 7 mm. long) from bigh in canal at Alexandria Bay, Thousand Islands, N.Y., September 1, 1919, (F. Johansen).

Many (younger) specimens from Montreal West, P.Q., October 19, 1918, (A. Willey coll.).

A great number of specimens from pools, streams, lakes and the river near and at Ottawa, April to October, 1917-1919, (F. Johansen).

I thus have it from the Gatineau river, Gatineau Point, Hull Park and outside of Hull city, Bridgman's Creek, Chelsea Road, Catfish Bay, Fairy Lake, foothills of Kings Mountain, Deschènes, etc., on the Quebec side of Ottawa district and from McKay Lake, Rockcliffe, etc., on the Ontario side.

It is exceedingly desirable that further data regarding the distribution of this common and important food for fishes and birds in Canada, both north, east and west of the records from Canada known so far (Quebec City to Georgian Bay), should be secured.

One of the two freshwater isopods occurring in Canada, *(Mancasellus)* is thus to be considered a more southern form with a limited distribution; the other *(Asellus)* has a much wider distribution from east to west, though its records from the United States seem to indicate, that it may not be found in the western provinces of Canada, nor in Alaska.

BIBLIOGRAPHY FOR CANADIAN FRESHWATER ISOPODS.

Boone. P. L. Isopods. Report of Canadian Arctic Expedition 1913-18, Vol. VII, Part D. Ottawa, 1920.

Hay, O. P. Notes on some Freshwater Crustacea 1882, (see under Amphipods).

Huntsman, A. G. Freshwater Malacostraca of Ontario, Contrib. to Canad. Biology, Fasc. II, p. 146-49.

Ortman, A. E. Malacostraca, in Freshwater Biology, 1918, p. 828-50. (see under Amphipods).

Richardson, H. Monograph on the Isopods of N.A., Bull, U.S.N. M. No. 54, Washington, 1905, p. 415, 420-421.

Smith, S. I. Crustacea Freshwater, U.S.A., Rep. U.S. Comm. Fish. Pt. 2, (1872-73), etc., (see under Amphipods).

Smith, S. I. and A. E. Verrill. Invert. dredg. in Lake Superior in 1871, (U.S. Lake Survey), etc., (see under Amphipods).

Smith, S. I. Prelim. Rep. Dredg., Lake Superior, 1871, (see under Amphipods).

Underwood, L. M. List of Freshwater Crustacea of North America (see under Amphipods).

Hunsman, A. G. Invertebrates, Nat. Hist. Toronto, Reg. 1913, p. 273-74, (see under Amphipods).

ADDITIONAL NOTES.

So little is known about the occurrence and habits of the freshwater-crustacea during the winter, that the following note in THE OTTAWA NATURALIST for September, 1907, p. 102, is of interest:

> "Mr. W. S. Odell reports an abnormal abundance (during the winter 1906-7) of certain crustacea observed under the following circumstances. At the openings cut through the ice on the clay ponds or pits near the Rideau River, crowded masses of *Canthocampus*, *Cyclops* and *Asellus aquaticus** came to the surface of the water. . . . The ice was about a foot in thickness, and the cold was intense, yet these water animals had not been so thick for many years. They decreased most markedly on the first mild day. . ."

In January, 1921, I received from Dr. A. G. Huntsman of Toronto, three *Asellus communis* Say, collected on October 31, 1920, near Milton, Yarmouth County, in southern Nova Scotia. Dr. Huntsman has kindly identified them as *Asellus communis* Say (same as *A. intermedius* Forbes). The specimens are in a poor condition; but as this is the first record of freshwater isopods from the Maritime provinces it should be included in this article.

*Probably A. communis Say (F.J.).

(To be continued.)

ARGULIDAE FROM THE SHUBENACADIE RIVER, NOVA SCOTIA.

BY CHARLES BRANCH WILSON, PH. D., STATE NORMAL SCHOOL, WESTFIELD, MASS., U.S.A.

A survey of the Shubenacadie river, which empties into the Basin of Minas, Nova Scotia, was recently made by Mr. A. H. Leim in connection with the Canadian shad fisheries. During this survey many specimens of both young and adult argulids were obtained at Shubenacadie with the tow-net in tidal water which seemed to be fresh rather than salt.

These specimens were sent to the present author for identification, and they proved to contain an abundance of both sexes of two species of *Argulus*, one of which had previously been found in many localities on the Atlantic coast farther south, while the other was new to science. The following record of these two species is herewith submitted.

ARGULUS ALOSAE Gould.

Argulus alosae Gould, Invertebrata of Massachusetts, 1841, p. 340, text figure: S. I. Smith, Report U. S. Com. Fish and Fisheries, 1872, p. 575 (281): R. Rathbun, Proc. U. S. National Museum, vol. 7, 1884, p. 485: J. F. Whiteaves, Cat. Marine Invertebrata of Eastern Canada, 1901, p. 216: C. B. Wilson, Proc. U. S. National Museum, vol. 25, 1902, p. 707, pl. 12; pl. 26, fig. 80.

Record of specimens. Ten specimens, including both sexes, were obtained August 1, 1919, at 8.45 p.m.: two males were obtained on the same date at 9.10 p.m.: a single male was obtained July 21, at 6.15 p.m.

Remarks. This species was doubtfully recorded by Mr. J. F. Whiteaves in the reference given above as attached to *Gasterosteus biaculeatus* Shaw, and other small fishes taken off Pictou island in the Gulf of St. Lawrence. All the other recorded localities are much farther south. The present record substantiates that of Whiteaves and fully establishes the species in Canadian waters. Again it has hitherto been found only upon fish hosts in salt water; the present specimens were captured in a tow-net in fresh water. Their presence in the tow makes it certain that they infest fish in the immediate vicinity, and it may be that they will be found some day upon the shad whose name they bear.

ARGULUS PIPERATUS, new species.

Record of specimens. Twenty-two specimens, of which six were females and the rest males, were obtained August 1, 1919, at 8.45 p.m. in company with the first lot of *Argulus alosae*. Another lot of ten specimens, including both sexes, were caught in the second towing, August 1 at 9.15 p.m. Five males were obtained July 31 at 9.50 p.m., and two males on the same date at 10.10 p.m. The majority of all these specimens were of small size although sexually mature. But a few of them were large enough to be regarded as fully developed adults, and from these the following description has been taken.

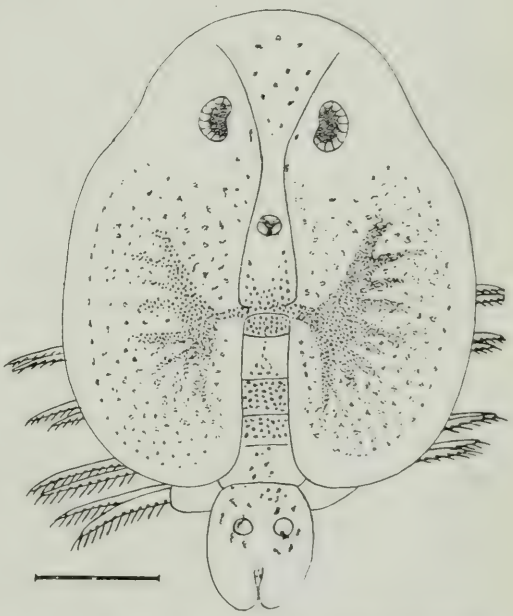


Fig. 1. Dorsal view of Argulus piperatus, female. The line represents a length of 1 mm.

Specific characters of female. General shape of the carapace elliptical, one-fourth longer than wide, with shallow lateral sinuses and broad, well rounded posterior lobes. Posterior sinus, one-third the length of the carapace, with parallel sides; posterior lobes just reaching the base of the abdomen. Eyes far forward and well separated.

Abdomen elliptical, one-fourth the length of the carapace, the longitudinal and transverse diameters in the proportion of 11 to 9; its posterior lobes well rounded and inclined inward so that their inner margins are in contact. Anal sinus 27.50% of the abdomen length; anal laminae basal, minute and unarmed; sperm receptacles small, circular and rather widely separated.



Fig. 2. Argulus piperatus; first and second antennae of male, much enlarged.

Lateral claw of basal joint of first antenna long and slender and curved into a half circle; anterior claw short and weak. Second joint slender, three times the length of the terminal joint, and armed at the distal anterior corner with a short spine; terminal joint tipped with two spines. Second antenna of the usual pattern, the basal joint one-half wider than the succeeding joints and tipped with a long spine; second joint with two spines, third and fourth joints with one spine each.



Fig. 3. Argulus piperatus; supporting rods in sucking disks; much enlarged.

Sucking disks of second maxillae far forward and well separated, each about 15% of the width of the carapace; the supporting rods slender and far apart, each made up of four cylindrical joints which diminish regularly in size from the base outwardly, and which do not quite reach the margin. The latter has a fringe of flattened fleshy setae, attached side by side in a single row.

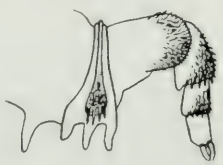


Fig. 4. Argulus piperatus; maxilliped of male; much enlarged.

The maxillipeds are rather short but stout; the triangular plate on their base is wide posteriorly and much narrowed anteriorly, but extends to the anterior margin of the appendage; the teeth are long and wide and bluntly rounded. Inside of the base of the appendage, on the ventral surface of the head, is an accessory tooth of the same pattern as those on the plate itself.

The rami of the swimming legs reach considerably beyond the margin of the carapace. The lobes on the basal joints of the fourth legs are small and not very prominent.

Color a light cartilage gray, the dorsal surface covered with small black dots, as though it had been sprinkled with pepper. These dots are not evenly distributed but are massed as shown in the figure.

Total length 5 mm. Carapace 4 mm. long, 3.25 mm. wide. Abdomen 1 mm. long, 0.90 mm. wide.

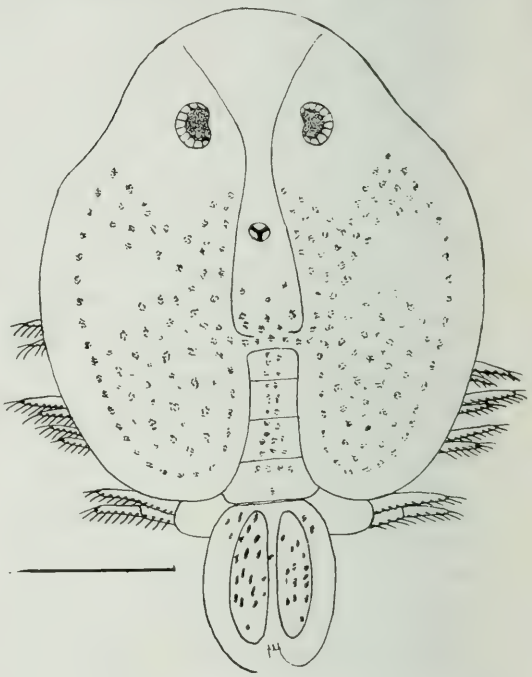


Fig. 5. Dorsal view of Argulus piperatus, male. The line represents a length of 1 mm.

Specific characters of male. Carapace relatively the same size and shape as in the female; abdomen longer, one-third the length of the carapace, the longitudinal and transverse diameters in the proportion of 15 to 11. Anal sinus not as deep, only 14% of the length of the abdomen and never closed by the approximation of the posterior lobes.



Fig. 6. Argulus piperatus; third legs of male, much enlarged.

Of the accessory sexual characters the peg on the anterior margin of the basal joint of the fourth legs is a broad cone, inclined strongly outwards and bluntly rounded at the tip, with a tiny spine on its

anterior margin. On the ventral surface of the basal joint of the third legs is a broad flap, projecting backwards, and on the anterior margin a rounded knob armed with minute setae.



Fig. 7. Argulus piperatus; fourth legs of male; much enlarged.

Color the same as in the female except that the black spots on the dorsal surface are larger and more scattered.

Total length 4 mm. Carapace 3 mm. long, 2.65 mm. wide. Abdomen 1 mm. long, 0.80 mm. wide. (*piperatus*, sprinkled with pepper, alluding to the black spots).

The types of this species are deposited in the Museum of the Atlantic Biological Station, St. Andrews, N.B.

BIRDS IN RELATION TO INSECT CONTROL.

By Norman Criddle, Entomological Laboratory, Treesbank, Man.

The value of birds to mankind has unfortunately been brought down to the level from which we guage most things nowadays, namely, dollars and cents. We might in the past, have classed them with art, poetry and music, but to-day the aesthetic side is lost in the mad rush for wealth and those of us who still value wild life for what it is, rather than for its economic significance, are obliged to weigh its qualities by the standard which modern thought demands.

The value of birds in relation to agriculture is a question that has frequently been discussed. The value of birds as destroyers of noxious insects is usually linked with the preceding problem though experts are not as unanimous in their conclusions regarding this part of the question, adverse contentions being especially strong among Italian entomologists who are apt to disclaim any assistance from birds to agriculture or kindred sciences. The Italians have their school of followers in North America but they are fewer. Since, however, they are men of ability it seems well to look rather more fully into the reasons for these differences of opinion.

Probably the first obstacle to unanimity lies in the fact that two sciences are involved namely ornithology and entomology whose voteries, on the whole, have but a superficial knowledge of each other's work. For instance, the ornithologist may be well aware that birds eat insects but he does not always know that the insects consumed may contain within them those that are useful. The entomologist on the other hand, knows little of the habits of birds and is, therefore, apt to view the question wholly as an insect one and to depend upon insects for insect control arguing that birds in eating a single noxious insect may destroy half a hundred useful ones, and so prevent the spread of allies that would control a pest far more quickly than birds could, even supposing the latter were able to accomplish the task at all.

The first point to accept in this discussion is that insect extermination is out of the question. The problem is not how to exterminate a pest but it is rather to secure the best means of keeping it within bounds.

I believe we shall eventually reach the conclusion that insect parasites are of most value in controlling serious outbreaks while birds reach their greatest usefulness by destroying the surplus under normal conditions and so prevent outbreaks. Neither of these differences in value are clearly defined, however, as a great many minor issues are involved in the whole question some of which I give below.

The rapid increase of an insect pest is due to several causes among which the absence of parasites is an important one. Under these circumstances the chances of birds destroying useful parasites in feeding upon the host at that time, is small, while by devouring the increasing pest they are playing an important part in keeping it within bounds. Occasionally, however, the pest increases beyond the rate at which birds can check it, this being due largely to meteorological conditions. At such times neither parasites nor birds are of much value and the pest spreads over wide areas as was exemplified in the grasshopper outbreak of the last two years in the Prairie Provinces. It is at this point that birds fall behind and parasites usually come to the fore and as these last have now unlimited food available they multiply with great rapidity. It matters little under these circumstances, whether birds devour parasites or not as the latter are too widely spread to be affected. Indeed the ultimate result is for the parasites to become over abundant in which case they are reduced to insignificance by starvation due

to the destruction of hosts. In eating the pest at this time birds are almost sure to devour even more parasites than hosts and by doing so they will actually help to preserve the latter by keeping down the surplus and so make room for those that remain.

One other point must be taken into consideration in connection with the part birds play in suppressing insect pests and that is while they may destroy numbers of parasites in eating the hosts they must necessarily prevent many of the hosts from depositing eggs thus enabling egg parasites and other egg enemies to concentrate upon those remaining. It might be contended on the other side, that birds are equally apt to destroy parasites in consuming insect eggs such blame being especially aimed at the Chickadee but I doubt very much whether the few useful insects destroyed in this way could compare with the value done by the birds in destroying thousands of insect eggs. Further, we must remember that many insect eggs are placed in the ground or in crevices, etc., where birds cannot get at them but where parasites can.

As a further point in the birds favour it may be pointed out that parasites are only present within the bodies of their hosts for a limited period of the hosts' life and, therefore, by eating the host before the latter becomes infested, birds are of unquestionable value to man; moreover, by this means they provide for a concentration of parasites upon the hosts that survive.

It will be noted that I have written nothing about hyperparasites in this paper, that is parasites which infest parasites. These complicate the whole question but to include them would not, I think, show birds in an unfavourable light.

Turning now to the part which birds play in actually devouring useful insects such as tachinid flies, syrphid flies, lady-beetles and other insects, we find that the birds by this habit actually reverse the arguments that have been used above but there is this in extenuation. With the exception of those I have mentioned and a few more, most of the useful insects (especially parasites) are small while the noxious ones are more often large and so easily detected. It would seen therefore, that far fewer useful insects are taken than harmful ones and this point is amply borne out by the examination of bird stomachs, as a glance through the bulletins of the U.S. Biological Survey will show.

One of the strong points in favour of the doctrine of insects controlling insects is illustrated in such pests as the hessian fly and western wheat-stem sawfly which are small and consequently little affected by birds. Naturally if these are kept in check by parasites there is not much reason why larger ones should not be. But the evidence is by no means conclusive that they are. With the hessian fly meteorological factors are of importance at least in some parts of the insects' range and this probably applies to the sawfly also. The relation of humidity to insect prevalence is, indeed, a very important question which, however, requires a separate article to do it justice.

There are unquestionably times when even severe insect outbreaks are controlled locally through the actions of birds, a well known example of which occurred in Utah many years ago when a locust infestation was cleaned up by gulls. We need not, however, go so far afield for similar evidence of the usefulness of gulls.

During the years 1919 and 1920, a serious outbreak of grasshoppers, formerly called locusts, occurred in south-west Manitoba which threatened large areas of growing grain and required the united efforts of government officials and farmers to keep it in check. This outbreak extended from Saskatchewan far to the eastward but in this extension there was a notable gap most marked in the districts in which Boissevaine, Whitewater and Ninga were situated. Since the soil is very similar over all this territory and offers equal inducements for grasshopper breeding the absence of the insects over it in destructive numbers might seem rather extraordinary, but I believe can be explained as follows: North of the villages mentioned above is a large marshy lake upon which a great many gulls and terns congregate and doubtless breed. In any case the birds make this lake their resting place and from it issue forth each day in quest of food. In the spring time before the small hoppers appear, the gulls may be seen in close attendance of the ploughman when they are often accompanied by black terns and frequently by crows and blackbirds all of which vie with each other in picking up the grubs and other insect life exposed by the plough. Later, when summerfallowing is under way and hoppers have attained sufficient size to be seen easily the gulls again devote much of their time to following the plough only now they spread out further afield and obtain a glorious feast of the grasshoppers which are endeavouring to make their way from the ploughed land to new feeding grounds.

At a still later date when harvest is beginning, the gulls and their allies take to the grain fields and roadways wandering up and down as if they imagined the waving grain were water and the grasshoppers the small fry swimming near the surface. But be that as it may the results are much the same. Many millions of grasshoppers have been eaten by the time the gulls take their departure and incidentally the farmer has reaped a far larger

crop than he would have done had the birds been absent. This, I think explains the absence of severe grasshopper outbreaks in the districts referred to.

There are very few birds that do not take advantage of a locust outbreak. Grouse find the insects especially palatable and several people are now learning to associate abundance of grasshoppers with the rearing of large families of grouse and this undoubtedly applies to several other birds.

It is, however, to those birds which congregate into flocks that we must look to most for help. I have already mentioned gulls in this respect, another is found in the crow. The crow is very fond of grasshoppers at any time and as the evidence shows, feeds its young largely upon them when they are sufficiently numerous. Indeed it is no exaggeration to state that a family of six crows would consume at least three bushels of grasshoppers in a season which would mean preventing about 9,000,000 of the insects' eggs from being laid.

In our grasshopper campaign of 1920 we ran across many instances of crows gathering in locust areas for feeding purposes. They were especially noticeable along roadways where fence or telephone poles afforded convenient resting places for their sentries. There is probably another reason for the crows gathering along roadways which is explained as follows: The outbreak of locusts referred to was made up of several species of which two were of special importance. These interestingly enough, have a marked difference in their choice of breeding sites, the one known as the Lesser-migratory locust choosing stubble fields or areas of semi-cultivation for egg-laying while the other, known as the Road-side locust, *(Camnula pellucida)* prefers the grassy road-sides for breeding purposes. On account of this habit the last-named insect is naturally massed within a comparatively small space which the crows have learnt to take advantage of.

Returning to the contention that birds frequently neutralize their usefulness in destroying noxious insects by eating the parasites at the same time, we have here at least a case where that was not so to any marked extent. Parasites of adult grasshoppers have been of small importance owing to their scarcity. Egg parasites, however, give far greater promise of eventually bringing the insects under control. Here then we have a case where the destruction of adult locusts by birds will reduce the possible egg supply and oblige the insect feeding upon them to gather upon what remain, thus giving a far greater assurance of reducing the pest quickly.

I will conclude with one more example which, though not conclusive, provides at least strong circumstantial evidence in favour of the birds involved. Some twelve miles from my home at Treesbank, Man., is a pretty little village surrounded by hills and trees, where crows have bred rather freely in the past. A few years ago, however, prominent citizens of this place came to the conclusion that the crows were greatly reducing the bird life, especially game birds, which the citizens looked upon as their own special privilege to kill. In consequence of this belief, these people inaugurated crow-destroying competitions in which they formed sides of equal number, those bringing in the greatest number of crows and their eggs winning a prize, which the losers had to pay. The result of this annual competition in crow destruction has had a marked effect upon crow life in the vicinity without apparently producing very noticeable results in the direction expected. What interests us here, however, is this. The district, which is a grain-growing one, was infested by a severe and isolated outbreak of grasshoppers last year, while surrounded areas where crows had been protected escaped. As I said above, this may be a coincidence, but since the region is no more suitable for grasshoppers than others nearby, such would hardly seem to be the case.

In the preceding remarks no effort has been made to plead the cause of birds, the evidence has merely been given as it was presented to me in the field. I have said nothing of the aesthetic side, yet few can depict anything more beautiful than a flock of gulls following a ploughman, flying with their graceful curves within a few inches of his head and darting down with a characteristic little flutter to pick up the insect newly exposed. To see them flying over the lakes is equally pleasing, and we ought surely to be thankful in realizing that such perfect creatures are our friends. This can be said with almost equal justice of many other birds, which, if they are not as pleasing to look upon, make up for that by a sweeter song or some other characteristic which should endear them to us.

ADDITIONS TO THE BIRDS OF SHOAL LAKE, MANITOBA.

By Ernest S. Norman.

The following species of birds have been observed by me at Kalevala, Man., which is situated approximately about 25 miles north of the north end of Shoal Lake.

RED-THROATED LOON, *Gavia lumme.* This bird is seen on Birch Lake, near Kalevala P.O., nearly every fall just before freeze-up. It arrives here generally several weeks after the common Loon and the Holboell's Grebe have left for the south. Only one or two seen at a time.

AMERICAN SCAUP DUCK, *Aythya marila.* Regular summer visitor, though perhaps less numerous than the Lesser Scaup. I have never found its nest though the Lesser Scaup's nests are often discovered.

TURKEY VULTURE, *Cathartes aura.* One individual of this species was seen several times in the spring of 1919. It came every day for two or three weeks to feed on a horse carcass, at which I had set some wolf traps on the winter previous. It was very tame and I had many chances of seeing it at very close range, being thereby able to establish the identity beyond any doubt.

COOPER'S HAWK, *Accipter cooperi.* This hawk is only an accidental summer visitor here. Nevertheless, I have seen it several times during the last six years.

GOLDEN EAGLE, *Aquila chrysaëtos.* One adult in a beautiful plumage was shot by Mr. G. Carlson, of Mulvihill, Man., in the summer of 1916. Mr. Carlson brought this bird to me for identification and later on sent it to Mr. W. Darby, the taxidermist, in Winnipeg, for mounting.

GREAT GRAY OWL, *Scotiaptex nebulosa.* One morning in February, 1918, I noticed an unusually long and fluffy feather hanging in a willow bush near my barn. I at once knew that it was that of an owl, but had never met here any species of owls with such tremendously long feathers. Several days later the puzzle was solved, when, in broad daylight a Great Gray Owl (the first one and only one that I have seen) flew to a shade tree in front of our house. It stayed around for several weeks after that.

RICHARDSON'S OWL, *Cryptoglaux tengmalmi richardsoni.* In the winter of 1914-15, several birds of this species were seen. They were very tame, coming sometimes in broad daylight into the barnyard where they could have been knocked down with a stick. None have been seen since.

SAW-WHET OWL, *Cryptoglaux acadica.* I saw one specimen of this little owl in June, 1918. I saw it on several occasions in one particular spot in a poplar bush. Hunted for the nest high and low, but it could not be found.

AMERICAN HAWK OWL, *Surnia ulula caparoch.* In the winters of 1914-15 and 1915-16 this was by far the most common of all the owls. It is possible that they were breeding, as few were met with right in the breeding season, in 1915. Not a single one has been observed here in the last three years.

ARCTIC THREE-TOED WOODPECKER, *Picoides arcticus.* Regular, though rare, winter visitor at Kalevala, Man. One or two can be seen in the poplar forests north of our post office almost any day during the cold weather.

NORTHERN PILEATED WOODPECKER, *Ceophlacus pileatus abieticola.* This largest of our northern woodpeckers was very common here six and seven years ago, when the first settlers arrived. On account of their unwary habits many of them fell easy victims to the Sunday hunter and the boy with "the 22." It has been entirely absent for two or three years, but last autumn (1919) a pair came into our poplar woods (where they are protected) and have stayed there all winter. They were seen nearly every day hammering at a large poplar stub just a short distance from our barn. As many of the largest poplars in our bush have very large holes excavated into them, it is almost certain that these birds used to breed here regularly not so very many years ago.

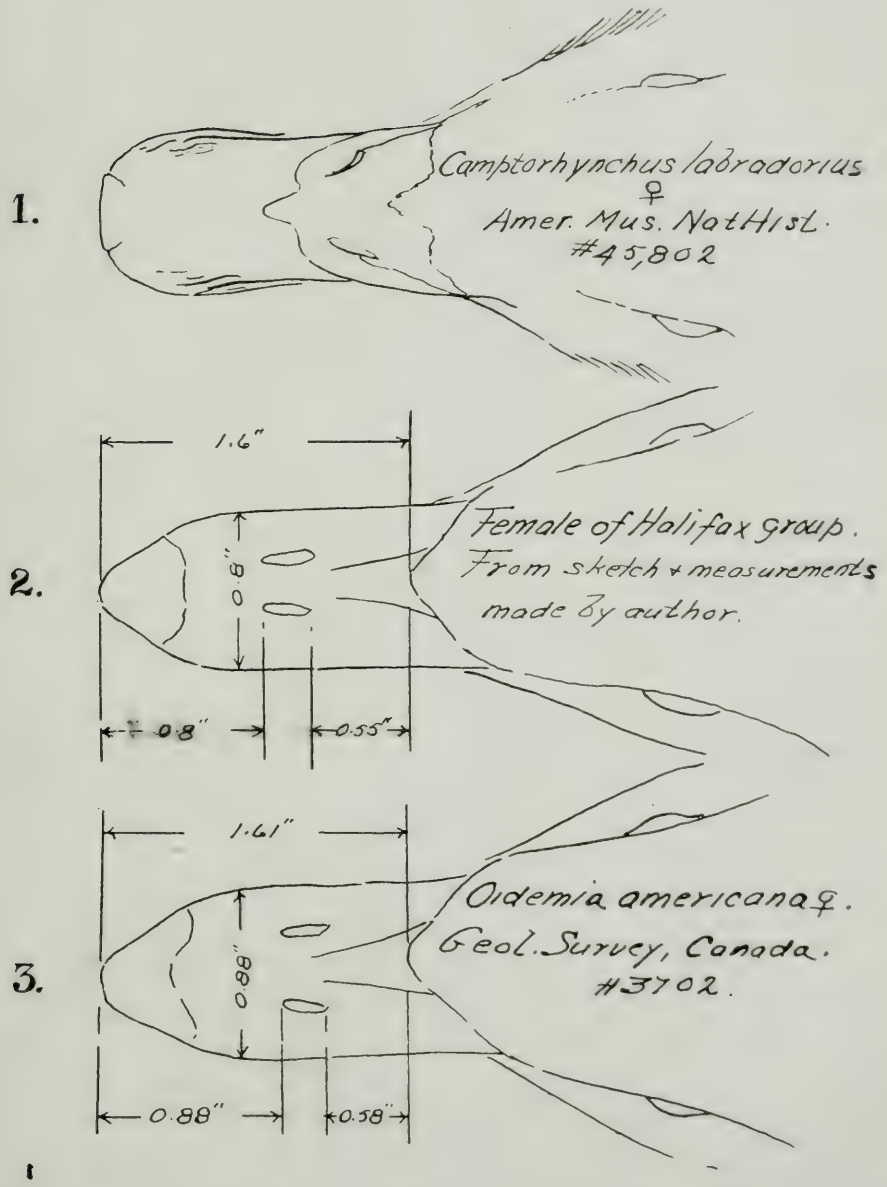
PINE GROSBEAK, *Pinicola enucleator leucura.* Common winter visitor at Kalevala, Man. Generally appears in small flocks from 4 or 5 to a dozen birds of both sexes. They are very tame and feed mostly on frozen high-bush cranberries.

REDPOLL, *Acanthis linaria.* Common winter visitor. Sometimes large flocks of several dozens of birds are seen. They feed on weed seeds and are far too tame for their own safety. The ordinary house cat generally catches more than its share of them.

WHITE-BREASTED NUTHATCH, *Sitta carolinensis.* Resident. Can be seen here any day both summer and winter.

THE DUCK SPECIMENS RECORDED AS LABRADOR DUCKS (*CAMPTO RHYNCHUS LABRADORIUS*) IN DALHOUSIE COLLEGE, HALIFAX, NOVA SCOTIA.

By Hoyes Lloyd.



1 - Traced from original drawing by Louis Agassiz Fuertes.

2&3 - by P. A. Taverner.

William Dutcher[1] revised the list of extant specimens of this extinct species in the collections and museums of the world. His totals were Canada 2; United States 25; Europe 11; amounting to 38 in all.

Subsequently A. B. Meyer[2] recorded a specimen in the Dresden Museum, Saxony, and Dr. Witmer Stone[3] recorded one from an old collection which brings the list of total known specimens to 40, distributed as follows: Canada 2; United States 26; Europe 12.

It may not be generally known that two of the 28 North American specimens a male and a female were reported by Dutcher on the authority of Thomas I. Egan and Andrew Downs as being in the collection of Dalhousie College at Halifax, Nova Scotia.

In April, 1919, I had the pleasure of visiting Dalhousie College and through the courtesy of Professor Moore was allowed to examine these specimens, both of which are mounted and carefully preserved under glass.

One is a male Labrador Duck *(Camptorhychus labradorius)* in full plumage and the other is an American Scoter *(Oidemia americana)* in the plumage of the female.

At the time, I neglected to notice the speculum of the bird in question, but Mr. R. W. Tufts, of Wolfville, Nova Scotia, has since examined the specimens to make sure of this point, and he reports that the supposed female Labrador Duck is so mounted that the characteristic speculum of that species would not be shown if it were present, but close examination of this specimen shows the absence of the special wing marking of the Labrador Duck.

Aside from this, the bill of the supposed female Labrador Duck shows it to be an American Scoter. To emphasize this point a sketch showing the upper aspect of the beaks of these two birds was drawn to scale and a comparative sketch showing the bill of a female Labrador Duck has been kindly prepared for me by Louis Agassiz Fuertes. These are shown in the figure.

It is stated with much regret that only one specimen of the Labrador Duck is known to exist in Canada today, and not two as has been supposed.

Note.—Fleming saw one in Montreal some years ago, which was not the specimen purchased by Dutcher, but its present condition, if still in existence is unknown.

1. The Auk, Vol. VIII, 1891, p. 201.
2. Ibid, Vol. IX, 1892, p. 389.
3. Ibid, Vol. X, 1893, p. 363.

NOTES AND OBSERVATIONS.

THE PROTHONOTARY WARBLER AT LONDON. On May 30, 1920, at 5.25 a.m., my attention was attracted by the notes of a Swamp Sparrow which was singing in a large elm tree. For the reason that Swamp Sparrows do not go up into large elms to sing, I set about locating this one to make sure of the identification, but before I could locate him in the tree, he flew into some willows only ten or fifteen yards away, and again started singing. I saw at once that he was no Swamp, but a warbler, and the glass showed pure yellow beneath, and pure yellow on top of the head, coupled with a tail that appeared very short and a bill larger in proportion than I remember on any other warbler. A Prothonotary, without the shadow of a doubt! Further study of his song indicated that while a Swamp Sparrow sings from four to six notes per second, the warbler was much more deliberate and used two seconds for his song which was invariably of six notes on the same pitch, and almost identical with the Swamp in tone. This is my first Prothonotary, and the second one this century in Ontario, the other being a specimen taken at Pelee by Taverner about 1915. Macoun's Catalogue quotes one specimen taken at Hamilton, and sight records, indefinite at that, from Toronto (Fleming) and N.B. (Chamberlain). Apparently there are two Canadian specimens in existence.

An eager party hunted my bird that Sunday afternoon, and I was after him with a gun on Monday, but when he left me, as he did in a few minutes, he flew east beyond hearing, and has not been heard from since.—W. E. SAUNDERS.

EPICUREAN TASTE IN SWALLOWS.—Near the village of Shazy, New York, lies Hearts Delight Farm, the property of W. H. Miner, who is not only a farmer at heart and in fact, but a lover of nature and of all things elevating and good.

Given such a man and a farm of 12,000 acres, with sufficient desire and opportunity for improvement along aesthetic as well as economic grounds, the ultimate achievement can hardly be forecasted.

At Hearts Delight, achievement is magnificent, but one phase only is to be noted here.

Protection of wild life, animate and inanimate, holds a prominent place in the owner's plans, and there the wild things may find home locations suited to their varied needs, and the woods and fields are everywhere vocal with bird song. Among others, Swallows are abundant, and the great feature of the splendid farm is the group of three enormous Martin houses on one of the large lawns. Two of these houses are nearly equal in size, about 4 by 7 feet, with perhaps 200 domiciles in each. The large one is 8 by 12 feet and contains about 400 domiciles. As nearly as one can see, every cavity is occupied, a very few of them with House Sparrows, but practically every one with Martins; which would mean in the neighbourhood of 800 pairs of these useful birds. At the rate of only four young to each nest, 5,000 birds would need to be fed everyday from June 10 to August 20. Surely the unfortunate insects that form the food of these birds, ought to become scarce, compelling long flights on the part of the parents to supply their young.

One seems to have an instinctive feeling that Swallows, catching their food on the wing, feed on almost everything that comes along, and that they hunt the whole air in general. Perhaps that is because we have an idea that we would act that way if we had the ability.

My experience at Chazy, on July 7, 1919, gives me a hint that this rule (of my own imagination) does not invariably apply. Here is a place where Martins are living in vast numbers, and yet, hawking over the lawn by the house, all day long, were Barn Swallows, and Barn Swallows only!

Why no Martins, and why the Swallows, if no Martins?

Questions are easier to ask than to answer.

All one can say in reply is that the Swallows were there, and that the Martins, though nesting absolutely in thousands within a quarter of a mile, were absent. Investigation showed that the grass of the lawn was infested by an insect, less than ½ inch long. Passing the hand over two or three feet of the grass would invariably cause one or more of these insects to rise from the grass, and after flying never more than eighteen inches high, and four feet in distance, they settled again. This low, short flight accounted for the motions of the Swallows, who were hawking back and forth at from one to two feet over the surface, swerving in their flight at intervals when an insect was to be caught.

The reasonable explanation is that these insects were very palatable to the Swallows, and unattractive to the Martins, but why this should be the case is a puzzle. There can be no doubt that the Martins knew of this source of food, because birds find out such things with marvellous facility when the facts are of sufficient interest, but why should an insect be so attractive to one species of bird, and so lacking in interest to another species, when so closely allied?—W. E. SAUNDERS

PROSECUTIONS—MIGRATORY BIRDS CONVENTION ACT AND NORTHWEST GAME ACT BY OFFICERS OF THE DOMINION PARKS BRANCH AND ROYAL CANADIAN MOUNTED POLICE.

MIGRATORY BIRDS CONVENTION ACT.

Francois Mandeville, Fort Smith, Northwest Territories, interfering with a game officer in the discharge of his duties. Fine $10.00 and costs.

William Goss, Kensington, Prince Edward Island, buying Canada Geese in closed season. Fine $10.00 and costs.

Austin Fluke, Gaspereau, Nova Scotia, possession of Black Ducks in closed season. Fine $10.00 and costs.

Fred B. Cox, Labrador Coast, Quebec, possession of Ducks in closed season. Fine $10.00 and costs.

John P. Cox, Halifax, Nova Scotia, possession of Eider Ducks in closed season. Fine $10.00 and costs.

John Chapman, Mossbank, Saskatchewan, shooting at Wild Ducks in closed season. Fine $10.00 and costs.

Charles Elder, Mossbank, Saskatchewan, hunting Wild Ducks in closed season. Fine $10.00 and costs.

William Pace, Meadowvale, Colchester Co., Nova Scotia, possession of a Downy Woodpecker. Fine $10.00.

W. L. Hendsbee, Hawkesbury, Nova Scotia, possession of Gull. Fine $10.00.

Nicholas Eull, Minnesota, U.S.A., shooting at Ducks in close season near Cudworth, Sask. Fine $10.00 and costs.

Tilman Landry, 7 Highfield Street, Amherst, Nova Scotia, possession of a Great Blue Heron. Fine $10.00 and costs.

Lucien Tinant, Oban, Saskatchewan, possession of nine Ducks in closed season. Fine $15.00 and costs.

Louis Blean, Montcalm Market, Quebec, P.Q., possession of Semipalmated Sandpiper. Fine $10.00 and costs.

Frank Pattenden, Bayfield, Westmoreland Co., New Brunswick, shooting Semipalmated Sandpiper. Fine $10.00 and costs.

Fern McMorris, Bayfield, New Brunswick, possession of three Semipalmated Sandpipers. Dismissed.

Charles Bent, Bayfield, New Brunswick, possession of Sandpiper. Fine $10.00 and costs.

James E. McDonald, Mira, Cape Breton Co., Nova Scotia, killing Scoters from a power-boat. Fine $10.00 and costs.

Frank Wheeler, Dominion, Cape Breton Co., Nova Scotia, possession one "Ring-necked Plover." Fine $10.00.

Robert Weaver, Doaktown, New Brunswick, in possession Pileated Woodpecker. Fine $10.00 and costs.

Charles Grotto, Trenton, Nova Scotia, attempting to kill Greater Scaup Duck by use of power-boat. Fine $10.00 and costs.

Daniel Levy, Little Tancook, Lunenburg Co., Nova Scotia, attempting to kill Black Duck by the use of a motor-boat. Fine $20.00 and costs.

Harvey Cross, Big Tancook Island, Lunenburg Co., Nova Scotia, attempting to kill Black Ducks by the use of a "Sunken Boat." Fine $20.00 and costs.

William Heizler, Oakland, Lunenburg County, Nova Scotia, attempting to kill Ducks by the use of a power-boat. Fine $20.00 and costs.

William Murdock, New Glasgow, Nova Scotia, attempting to kill Greater Scaup Duck by use of power-boat. Fine $10.00 and costs.

Walter Winsloe, Trenton, Nova Scotia, attempting to kill Greater Scaup Duck by use of power-boat. Dismissed.

Alexander Grotto, Trenton, Nova Scotia, attempting to kill Greater Scaup Duck from a power-boat. Dismissed.

NORTHWEST GAME ACT PROSECUTIONS.

W. F. Dow, Fort Rae, Northwest Territories, possession two Musk Ox skins. Seizure.

D'Arcy Arden, Dease River, Great Bear Lake, Northwest Territories, possession Musk Ox skins. Seizure.

BIRD BANDING WORK BEING TAKEN OVER BY THE UNITED STATES BUREAU OF BIOLOGICAL SURVEY.—The Bureau of Biological Survey at Washington, D.C., has taken over the work formelly carried on under the auspices of the Linnaean Society of New York by the American Bird Banding Association. In taking over this work the Bureau feels that it should express the debt that students of ornithology in this country owe to Mr. Howard H. Cleaves for the devotion and success with which he has conducted this investigation up to a point where it has outgrown the possibilities of his personal supervision.

Under plans now being formulated this work will give a great amount of invaluable information concerning the migration and distribution of North American birds which will be of direct service in the administration of the Migratory Bird Treaty Act, as well as of much general scientific interest.

It is desired to develop this work along two principal lines;—first, the trapping and banding of waterfowl, especially ducks and geese, on both their breeding and winter grounds; and secondly, the systematic trapping of land birds as initiated by Mr. S. Prentiss Baldwin, the early results of which have been published by him in the Proceedings of the Linnaean Society of New York, No. 31, 1919, pp. 23-55. It is planned to enlist the interest and services of volunteer workers, who will undertake to operate and maintain trapping stations throughout the year, banding new birds and recording the data from those previously banded. The results from a series of stations thus operated will undoubtedly give new insight into migration routes; speed of travel during migration; longevity of species; affinity for the same nesting-site year after year; and, in addition, furnish a wealth of information relative to the behavior of the individual, heretofore impossible because of the difficulty of keeping one particular bird under observation.

The details of operation are now receiving close attention, and as soon as possible the issue of bands will be announced, with full information regarding the methods to be followed and the results expected. In the meantime, the Biological Survey will be glad to receive communications from those sufficiently interested and satisfactorily located to engage in this work during their leisure time, for it is obvious that a considerable part must be done by volunteer operators. It is hoped that a sufficient number will take this up to insure the complete success of the project.—E. W. NELSON, *Chief of Bureau.*

MIGRATION STUDIES BY BIRD BANDING.—The work of bird-banding referred to above by Dr. E. W. Nelson, which is now being taken over by the U.S. Biological Survey, is a system of placing registered numbered aluminum bands on the legs of birds which are then liberated so if again taken information may be derived on their lives, habits and movements. The amount of exact information that might be obtained in this and in no other practical manner is very great indeed. For years we have each had ideas as to whether birds returned to their old haunts year after year, the permanency of their matings, ages, routes of travel, etc., but it was mostly guesswork and authorities disagreed. Under the bird-banding association organized under Mr. Harold Cleves and others some of these questions are in a fair way of exact solution.

Our own Jack Miner, of wild goose fame, whilst working independently of the bird-banding association has done considerable in this direction with the wild fowl. His geese banded at Kingsville,

near Lake Erie, Essex Co., Ontario, have been taken on the Atlantic Coast from New Jersey to North Carolina and along the east shore of James and Hudson Bay. He has had returns also from ducks from Louisiana and the Gulf States, north to Sault Ste. Marie and west as far as Alberta. These irregular (?) migration routes are of special interest in confirmation of the soundness of the view that proper protection of migratory game is an interprovincial problem more than a local one and well within the logical field of federal authority.

The systematic trapping done by Mr. S. Prentis Baldwin mentioned by Dr. Nelson is a development of these activities and has opened up unlimited possibilities to the work. Normally but very few land birds banded are ever heard of again. In the work cited some surprising and valuable results have resulted from constant and systematic trapping of small birds within a limited area. A box trap made of fine meshed poultry wire is used which captures the birds without injury and from which they can be removed, banded and released, without other damage than a little passing fright. To show how evanescent this is Mr. Baldwin says that many individuals acquire what he calls "the trap habit" and return again and again, even many times a day, to the annoyance of the trapper, for the easily secured food supplies offered by the bait and they even wait patiently for the apparently expected liberation. All told he has so handled some five thousand birds in this manner and amongst the most interesting facts that the work has brought out are the following,—

Many birds do return to the same locality year after year but not always to the same spot. The chances seem to be about one in five, that at least one of a pair will return to the previous year's nesting site and about one in twenty-five that both will. In some cases birds that seemed to be the same as last season's friends proved to be entire strangers whilst the old marked ones were found nesting at some little distance.

The martial tie is somewhat looser in some cases than had been expected and not only do some birds often change mates from season to season but even for successive broods during the same season. A second brood in a nesting box was found to have one new parent whilst the jilted one was discovered helping to care for another family nearby.

It is also shown that as soon as the young are out of the nest they are usually taken immediately quite away from the vicinity. A family of young Wrens were found at the end of the first day some three hundred yards distant from their natal home.

The average daily range of many birds is surprisingly restricted. With traps set one hundred yards apart "repeaters," birds returning again and again to the trap, were rarely taken more than one trap away from their usual station.

Not only do birds return annually to their summer homes but to their winter ones as well and even along the way between follow the same locality stations year after year. Migrants merely passing through, have been taken on successive years, up to three, under the same bush.

Another bit of interesting evidence is on the actual mechanics of migration. It seems that the species studied do not pass along on their vernal and autumnal passages doing daily stints of travel, but pause for a while here and there where food is good and while the weather is fine, to pass on with, or just before, the storm that brings others of their kinds along.

All this is most interesting and valuable work and is such that many of otherwise limited opportunity can follow and, whilst indulging in a pursuit, fascinating in itself, amass a large amount of information of great popular, economic and scientific value. It is well that such important work is being directed by the experienced Bureau of the Biological Survey and that steps will be taken to extend its scope and correlate its results.

P. A. TAVERNER.

THE JAEGER AT SYLVAN LAKE, ALTA.—While living at Sylvan Lake, Alberta, this summer, I was fortunate enough in September, to observe a fine Jaeger attacking a Common Tern. This gave me a splendid opportunity to observe this unusual visitor. When finally the Tern escaped, the Jaeger settled on the water, and with my prism binoculars I was able to note its every feature. The upper parts were very dark while the throat underparts appeared to be a creamy white.

This is the second time I have seen this species at Sylvan Lake. In June, 1916, hearing an unusual note above the din of a large flock of Franklin gulls feeding in the bay, I saw what for the moment I took to be a fish hawk swooping about amongst the gulls, but as it poised above them for a second I was amazed to see the long middle tail feathers. Shortly after it settled on the water, and I watched it for a long time with my binoculars. I did not report this occurrence outside my own circle of friends, thinking I would not be believed, but, now with the advent of the second one I am glad to report this record for Alberta.—ELSIE CASSELS.

BOOK NOTICE.

BIRDS OF EASTERN CANADA, Memoir 104, No. 3, Biological Series, Geological Survey of Canada, by P. A. Taverner: King's Printer, Ottawa, 1919. 297 pages, octavo with 50 colored plates, illustrating 105 species and varieties; price 50 cents.

The introduction to this work is unusually attractive, and will be found both interesting and instructive to the student of Birds. It deals with classification, distribution and other problems and even has a chapter on Attracting Birds about the home.

The index appears very complete and comprises English, French, and scientific names.

A most useful feature, that might well be copied in similar works is the description of the different classes, orders and families. Too often the young student is left to surmise as to the scope of these divisions of the science.

One of the most attractive features of the book is the inclusion of the section "Field Marks." No other part of the work will receive as earnest study from puzzled nature students, to whom unidentified birds are a frequent experience. After one has pursued birds long enough to have identified 75 species, he is apt to make a good guess at the identity of any unknown, and needs only confirmation from a book to change surmise into certainty, and the section under consideration provides easy reference for such a puzzle.

The key is good, but if a key is worth providing, it is worth while to carry it out to the limit, and not abandon the seeker after knowledge at the broad heading "Sparrows," and leave him to grope through 34 different species, when a color key could easily have been given on a few added pages.

The colored plates, by Frank Hennessey, are on the whole, very creditable. Indeed, the colors are exceptionally true to nature. It would seem to the writer that this book illustrates well a missed opportunity. To certain of a large circle of readers, it is regrettable that the contents of the book are limited so nearly to bare outlines. It has come out as very little more than a book of reference, wasting a splendid opportunity to change casual readers into bird-loving enthusiasts. There are so many interesting details of bird life that could be added to such work, and the author is so competent to add them, that one is almost tempted to regret that the book was sent out ill equipped for what might have been a greater accomplishment.

It happens to come within the scope of the reviewers knowledge that the added touches, without which the book makes comparatively uninteresting reading, were actually provided by the author, and were eliminated by a mistaken editorial policy. The reason, for the elimination is unknown, but could hardly have been aught than either poor judgment or economy. For the sake of the future, it is to hoped that it was not the former, and if the reason were economy, it was a most erroneous application of the term. True economy lies in the production of the greaest and best results at a reasonable cost. In the case of a train from Toronto to Ottawa, there might be an economy of coal in stopping the train 10 miles before its destination, but no one would be so deluded as to claim real economy in throwing the passengers on their own resources for the last ten miles, when the equipment was ready to complete the journey. The present instance is a parallel. The names of the birds have been published, descriptions added, field marks, nesting, distribution, all of the skeleton on which to hang vital and interesting facts, clothed in language that would attract the casual reader and open many eyes to the charm that lies in this as in every other department of natural science, but the opportunity has been lost through no fault of the author.

It is so unusual, in such a work to omit all details of the capture of rarities, that the reviewer cannot become sufficiently accustomed to the change to consider it other than an error of omission. Take for instance, Blue-wing Warbler. "Though taken only once in Canada," how much better to have said, "One taken at Point Pelee on September 2nd, 1906, is the only Canadian specimen." The information might just as well have been given definitely while the writer was at it, and the book would have been worth just that much more as a reference.

Perhaps one may be judged meticulous for such fault finding, but the duty of the reviewer is to state the case as he sees it, in the hope that his opinion may have a favorable influence in the future.

W. E. SAUNDERS, London, Ont.

THE CANADIAN FIELD-NATURALIST

VOL. XXXIV. OTTAWA, ONT., DECEMBER, 1920 No. 9

THE VERTEBRATES OF THE OTTER LAKE REGION, DORSET, ONTARIO.

By A. H. Wright and S. E. R. Simpson.

(Continued from Vol. XXXIV, page 145).

IV.—THE BIRDS.

By A .H. Wright and S. E. R. Simpson.

The birds of this region have received attention through all the years of this camp's establishment. Each year either at the beginning of camp or in the later portion, bird contests have been held and almost every year of its ten years' existence the camp has had a naturalist among the councillors in residence from June 28 or July 1 to September 1 or 10. This list is based mainly on the records of the two authors for the seasons of 1913 and 1919, and is now put in form to stimulate recording of subsequent finds. We are sure there are forms omitted but some of the naturalists did not keep notes and prefer to leave almost certain observations unrecorded because of memory's tricks. Our list then is almost solely a summer list with several additions in prospect. It numbers 122 species. Comparable notes are those of Messrs. W. E. Saunders[1] and John M. Cooper[2] on birds observed in Algonquin Park.

Our greatest thanks are due to Mr. J. H. Fleming[3] for his courtesies previous to our trip. In many ways the most useful list in the field was his "List of the Birds of the Districts of Parry Sound and Muskoka, Ontario," also his "Birds of Toronto."[4]

The authors have found very helpful Macoun's and Macoun's Cat. of Canadian Birds; the works of C. W. Nash and Thomas McIlwraith; and the subsequent work on "Birds of Eastern Canada, 1919," by P. A. Taverner to whom they owe favors for assistance in 1913. Of assistance were the three lists of "Birds of Ottawa" in this journal (1881, 1891, 1910-11). Subsequent work can well center on fall migration, breeding data, more records of waterfowl, shore-birds and birds-of-prey. There are twenty or more species yet to be sought in summer or previous records which need verification.

1. *Colymbus auritus* Linn. Horned Grebe.

One reported from Lake of Bays, August 22, 1911, by Mrs. J. M. Haber.

2. *Podilymbus podiceps* (Linn.). Pied-billed Grebe.

Present in summer but scarce in this region. Mr. G. M. O'Connell reports them from Lower Fletcher lake where the residents claim they were more common in earlier days.

3. *Gavia immer* (Brunn.). Loon.

Common on all the lakes and one of the most distinctive birds of the Lake of Bays country. A nest with two eggs found on an island in Otter lake the last week of June, 1919. Later, July 7, two young were seen on Otter lake. In 1913, the newly hatched egg shells were found on an island on Otter lake. Young not infrequently observed throughout the region. Several nests have been found on Otter lake since the camp was established.

4. *Larus argentatus* Pont. Herring Gull.

Common on Lake of Bays; less frequent in the smaller lakes to the northward.

5. *Mergus americanus* Cass. American Merganser.

The most common duck of the lakes of this region. Every lake has a pair or more and one of the most spirited sights is a parent bird with its young. They either swim away or frequently half swim and half fly along the surface to a safe distance. These broods are frequently recorded in the first weeks of July and even later.

6. *Lophodytes cucullatus* (Linn.). Hooded Merganser.

Mr. L. A. Fuertes observed a female with a flock of four to five young.

7. *Anas rubripes* Brewster. Black Duck.

In 1919 common on all the lakes in August and present every season.

(1) Saunders, W. E., Birds of Algonquin Park. The Ottawa Naturalist, Vol. XXIX., Feb., 1916, No. 11, pp. 145-150.

(2) Cooper, J. M., Ottawa Naturalist, XXX., No. 10, Jan., 1917, pp. 125-129.

(3) Auk., Vol. XVIII., pp. 33-45.

(4) Auk., Vol. XXIII., pp. 437-453; XXIV., 71-89. Also "Birds" in "Natural History of the Toronto Region, 1913," pp. 212-237.

8. *Aix sponsa* (Linn.). Wood Duck.

One female was seen at outlet of Otter lake, August 21, 1919, the same locality in which it was reported in 1913. Also reported by G. M. O'Connell, Mrs. A. T. Kerr, and others.

9. *Botaurus lentiginosus* (Montag.) American Bittern. "Plum Gudgeons," "Stake Drivers," "Bill Gudgeons."

Scarce. One seen August 16, 1919 in a marsh at Hardwood lake. One recorded at North Bay in August, 1911, by Mrs. Julia Moesel Haber.

10. *Ardea herodias* Linn. Great Blue Heron.

Common. Capt. Jones, fire ranger reports them as nesting at Crain lake.

11. *Nycticorax nycticorax naevius* (Bodd.). Black-crowned Night Heron.

One in immature plumage recorded on August 27, 1913 at Camp lake.

12. *Gallinago delicata* (Ord.). Wilson's Snipe.

The natives report a few in these lakes in the summer, but we have not seen this species as yet.

13. *Ereunetes pusillus* (Linn.). Semipalmated Sandpiper.

Reported August 16, 1919, in lower Algonquin Park.

14. *Totanus flavipes* (Gmel.). Yellow-legs.

Three were seen August 26, 1913, at Fletcher Lake by G. O. McConnell. One reported from Algonquin Park by C. Huber, August 16, 1919.

15. *Helodromas solitarius* (Wils.). Solitary Sandpiper.

One was seen at a marsh near Otter lake, July 12, 1919. On August 24, two were seen at the same place with young.

16. *Actitis macularia* (Linn.). Spotted Sandpiper.

Common.

17. *Oxyechus vociferus* (Linn.). Killdeer.

One was heard August 2, 1913 near Dorset, also another August, 1919 at Crozier lake. A female with three young were seen August 21, 1911, by Mrs. Haber at North Bay.

18. *Aegialitis semipalmata* (Bonap.). Ring-neck Plover.

One reported at Otter lake, August 19, 1913.

19. *Canachites canadensis* (Linn.). "Spruce Partridge."

Dr. Abram T. Kerr reports a specimen brought to him in camp several years ago. The natives report quite a few. G. M. O'Connell reports that he killed one Spruce Grouse near Otter lake.

20. *Bonasa umbellus togata* (Linn.). Canadian Ruffed Grouse.

Common. Many adults and young recorded about camp every year.

21. *Pediocoetes phasianellus* (Linn.). Sharp-tailed Grouse.

On July 20, 1913, near Hardwood lake we saw what we took to be a sharp-tailed grouse though never familiar with it before in the field. This rather negative note is introduced because of the reported spread of this form into this region.

22. *Circus hudsonius* (Linn.). Marsh Hawk.

Two recorded August 2, 1913 and two during the summer of 1919. At Point Lumini, Mrs. Haber recorded one August 20, 1911.

23. *Accipiter velox* (Wils.). Sharp-shinned Hawk.

One reported August 26, 1919 at Hardwood lake by Mr. G. Wilson.

24. *Accipiter cooperi* (Bonap.). Cooper's Hawk.

Rare. One was observed July 28, 1913 at the camp.

25. *Buteo borealis* (Gmel.). Red-tailed Hawk.

Mrs. J. M. Haber saw it August 24, 1911 at Fox Point. Three seen in 1913 and one in 1919.

26. *Buteo lineatus* (Gmel.). Red-shouldered Hawk.

One reported by Mr. C. Huber, August, 1919, and another at Hollow lake, August 11, 1913.

27. *Buteo platyperus* (Vieill.). Broad-winged Hawk.

Most common of all the hawks in the region. In 1919 it nested at the camp.

28. *Haliaeetus leucocephalus* (Linn.). Bald Eagle.

One recorded July 7, 1913 at Otter lake. In 1919 one immature recorded at Harvey Jr. lake, August 9 and one adult in Algonquin Park, August 15.

29. *Falco sparverius* (Linn.). Sparrow Hawk.

One was seen August 29, 1919 at Huntsville and another August 12, 1913 at Hollow lake.

30. *Pandion haliaëtus carolinensis* (Gmel.). Osprey.

In 1913 one was seen (August 4) over the Peat Bog, Otter lake. In 1919 one was reported over Hollow lake, August 12.

31. *Strix varia* Barton. Barred Owl.

Three were recorded in 1913 and one in 1919. Others heard in each year.

32. *Cryptoglaux acadica* (Gmel.). Saw-whet Owl.

Two heard in July, 1913. One seen on August 8, 1919, near the camp.

33. *Bubo virginianus* (Gmel.). Horned Owl.

In a deserted lumber cabin, the dried skin and skeleton of a horned owl was found (July 14, 1919) filled with porcupine quills.

34. *Coccyzus erythropthalmus* (Wils.). Black-billed Cuckoo.

Common. Frequently heard at night.

35. *Ceryle alcyon* (Linn.). Belted Kingfisher.

Common on all the lakes.

36. *Dryobates villosus* (Linn.). Hairy Woodpecker.

Common.

37. *Dryobates pubescens medianus* (Swains.). Downy Woodpecker.

Much less common than the preceding species. In 1919 apparently more common in August than July.

38. *Picoides arcticus* (Swain.) Arctic Three-toed Woodpecker.

On August 24, 1911, two males were seen at Fox Point (Mrs. J. M. Haber). On August 4, 1913, at camp a female was observed feeding its young and later the species was recorded on August 27. In 1919, (Aug. 16) one was shot on a trip to Algonquin Park. Also recorded by Fuertes, Kilburn, Palmer, O'Connell and others.

39. *Sphyrapicus varius* (Linn.). Yellow-bellied Sapsucker.

Easily the most common woodpecker of the region. Many nests and young recorded.

40. *Phloeotomus pileatus abieticola* (Bangs.) Pileated Woodpecker. "Wood cock."

Not common. On August 24, and 26, 1911, Mrs. J. M. Haber recorded it at Fox Point. On August 25, 1913, we saw a "cock of the woods" at Fletcher lake and another at camp August 31. On August 31, behind the camp we found a sound maple stump with typical holes of the species. In 1919 three were recorded at Hardwood lake. The natives hold this and the Spruce Grouse the two handsomest birds of the region.

41. *Melanerpes erythrocephalus* (Linn.). Red-headed Woodpecker.

Uncommon. One was heard back of camp July 5, 1913 and one seen August 11, 1913 at the same place. In 1919 two more were recorded in same locality. Mr. G. M. O'Connell also reports one from Dorset.

42. *Colaptes aureus luteus* Bangs. Northern Flicker.

Common.

43. *Antrostomus vociferus* (Wils.). Whip-poor-will.

A few recorded each season. The natives say they are very common in the spring.

44. *Chordeiles virginianus* (Gmel.) Nighthawk.

Common summer resident. Seen every evening on the wing. Nest with two eggs found in a potato patch near the camp July 2, 1919.

45. *Chaetura pelagica* (Linn.). Chimney Swift.

Very common summer resident. Nest with four young found in an old barn at Hollow lake, July 26, 1919.

46. *Archilochus colubris* (Linn.). Ruby-throated Hummingbird.

Common in all parts of the woods. They are very partial to sapsucker borings and quarrel with this species for possession of such trees.

47. *Tyrannus tyrannus* (Linn.). Kingbird.

Common summer resident.

48. *Myiarchus crinitus* (Linn.). Crested Flycatcher.

Quite common summer resident.

49. *Sayornis phoebe* (Lath.). Phoebe.

Quite common summer resident. Nests each year about the camp.

50. *Nuttallornis borealis* (Swains.) Olive-sided Flycatcher.

Common in all the more open woods and in the swamps. Very quiet in August.

51. *Myiochanes virens* (Linn.) Wood Pewee.

Common.

52. *Empidonax flaviventris* (Baird). Yellow-bellied Flycatcher.

Recorded in 1919 on two occasions, August 10 at Harvey Jr. lake trail and August 13 back of camp. In 1913 two or three records were made.

53. *Empidonax traillii alnorum* (Brewst.). Alder Flycatcher.

On July 28, 1919, M. C. Huber found a nest with four young in the crotch of a young tree. Later the junior author saw the young and one parent in the thickets.

54. *Empidonax minimus* (W. M. and S. F. Baird.) Least Flycatcher.

Common summer resident.

55. *Cyanocitta cristata* (Linn.) Blue Jay.

Very common. Large flocks were seen assembling for migration after the middle of August.

56. *Perisoreus canadensis* (Linn.). Canada Jay. "Meat Hawk."

Reported more common in fall and winter. Recorded by L. A. Fuertes. Several seen by Carl Huber in Algonquin Park, August 12-16, 1919.

57. *Corvus corax principalis* Ridgw. Raven.

Rare in summer. More in winter. In the more densely wooded portions. In times past they were abundant. Some of the natives attribute its reduction in numbers in this region to their being killed off by poisoned-bait set for foxes, etc. One recorded at Otter lake, August 31, 1913.

58. *Corvus brachyrhynchos* Brehm. Crow

A few observed at camp and around Dorset in 1919. In 1913 and 1911 a few recorded on Lake of Bays. Considered more common in early spring and very scarce in winter.

59. *Agelaius phoeniceus* (Linn.). Red-winged Blackbird.

Not common. One reported August 7, 1913 at Otter Lake; five females at Peat Bog, August 1, 1919, several at Dorset during summer of 1919 and also in August, 1911 at Point Lumini.

60. *Sturnella magna* (Linn.). Meadowlark.

In 1913 one member of the camp reported a meadowlark near Hardwood lake but the natives say they occur in cultivated fields of the region but not at Dorset. Mr. G. M. O'Connell reports one nest found during his seven years at camp.

61. *Icterus galbula* (Linn.). Baltimore Oriole.

Rare. The only definite record we have is at Huntsville, July 1, 1919, but not at camp or surrounding territory as yet.

62. *Euphagus carolinus* (Mull.). Rusty Grackle.

On August 26, 1919 a flock of ten seen at Dorset. In 1913 three were observed at Otter Lake, August 9.

63. *Quiscalus quiscula aeneus* Ridgw. Bronzed Grackle.

Common summer resident

64. *Carpodacus purpureus* (Gmel.). Purple Finch.

Common summer resident throughout the region. Its song is one of the most startling of the woods and is heard through July and most of August.

65. *Passer domesticus* (Linn.). House Sparrow.

In 1913 several were seen at Dorset where in 1919 they were quite common. One recorded at camp July 4, 1919.

66. *Loxia curvirostra minor* (Brehm.). Am. Crossbill.

Not common resident. Several flocks around Otter lake in August, 1913. Common enough in spring for the residents to note it.

67. *Loxia leucoptera* Gmel. White-winged Crossbill.

One fall (September) a flock were around camp for two or three days. (G. M. O'Connell).

68. *Astragalinus tristis* (Linn.). American Goldfinch.

Common summer resident.

69. *Spinus pinus* (Wils.). Pine Siskin.

Several seen at Camp Otter on August 3 and 7 1913.

70. *Pooecetes gramineus* (Gmel.). Vesper Sparrow.

Common in the fields around Dorset and in Lake of Bays region. Nest with three eggs found at Otter Lake, August 3, 1919.

71. *Passerculus sandwichensis savanna* (Wils.). Savannah Sparrow.

Rare. Two heard at Dorset July 6, 1913 and one near Hollow lake, July 28, 1919. Several recorded at Huntsville.

72. *Zonotrichia albicollis* (Gmel.). White throated Sparrow.

Very common species. A nest with four eggs was found July 22, 1913, in a a carpet of *Lycopodium undulatum.*

73. *Spizella passerina* (Bech.) Chipping Sparrow.

Common summer resident.

74. *Junco hyemalis* (Linn.). Junco.

Common summer resident. A nest was found August 2, 1919 in a huckleberry and blueberry patch at Rock Point, Otter lake, and young were on the wing July 10, 1913.

75. *Melospiza melodia* (Wils.). Song Sparrow.

Not uncommon summer resident especially in swampy places.

76. *Melospiza georgiana* (Lath.). Swamp Sparrow.

Fairly common around camp, e.g. Gem Lake, the Peat Bog and other marshy places.

77. *Pipilo erythrophthalmus* (Linn.). Towhee.

Reported July 14, 1913, between camp and Dorset. Seen in 1911 near Dorset by G. M. O'Connell.

78. *Zamelodia ludoviciana* (Linn.). Rose-breasted Grosbeak.

Common in all parts of the woods. One of the most striking birds of the region.

79. *Passerina cyanea* (Linn.). Indigo Bunting.

In 1911 it was reported at Point Lumini (Mrs. J. M. Haber). In July, 1913, several were heard and seen about Otter and Hardwood lakes, also at Dorset, and in August, 1919, Mrs. A. T. Kerr reported it.

80. *Piranga erythromelas* Vieill. Scarlet Tanager.

Quite common summer resident. Not as common as the the rose-breasted grosbeak.

81. *Progne subis* (Linn.). Purple Martin.

One recorded July 26, 1931 at Otter lake.

82. *Petrochelidon lunifrons lunifrons* (Say.). Cliff Swallow.

On August 2, 1913, a flock of forty was seen at McaEachern landing of Otter lake, others along road to Dorset and also at Dorset. One record for 1919.

83. *Hirundo erythrogaster* Bodd. Barn Swallow.

Nearly as common as the Chimney Swift. Young about to leave nest when camp begins.

84. *Iridoprocne bicolor* (Vieill.). Tree swallow.

Not common.

85. *Riparia riparia* (Linn.) Bank Swallow.

Several recorded both in 1913 and in 1919. A colony is said to inhabit a sand-bank on the Dorset-Hollow lake road.

86. *Bombycilla cedrorum* Vieill. Cedar Waxwing.

Common summer resident. Two nests found in 1919: one with five eggs in a balsam fir in front of camp, and hatched August 18; another at Hardwood lake, eggs hatching August 16.

87. *Vireosylva olivacea* (Linn.). Red-eyed Vireo.

The only common vireo of the region. Several nests of eggs or young found during the summer of 1919.

88. *Vireosylva philadelphia* Cass. Philadelphia Vireo.

On June 29 and July 1, 1913, one was seen near the camp.

89. *Vireosylva gilva* (Vieill.). Warbling Vireo.

One recorded July 2, 1919, in American elms at Dorset.

90. *Lanivireo flavifrons* (Vieill.). Yellow-throated Vireo.

Two seen at camp, July 28, 1919.

91. *Lanivireo solitarius* (Wils.). Blueheaded Vireo.

One recorded July 28, 1913, at portage between Skin and Porridge lakes.

92. *Mniotilta varia* (Linn.). Black and White Warbler.

Common resident. In August numbers apparently much increased from migrations. Young recorded on wing July 9, 1913.

93. *Vermivora rubricapilla* (Wils.). Nashville Warbler.

Quite common. Several seen in 1913 and also in 1919.

94. *Compsothlypis americana usneae* Brewst. Northern Parula Warbler.

In 1913, a beautiful male was singing near our tent on June 29. Later saw another on Hardwood road. In 1919 in August two more records were made.

95. *Dendroica aestiva* (Gmel.). Yellow Warbler.

Uncommon. In 1913 recorded at portage railroad of Lake of Bays, at Dorset and one or two at east end of Otter lake. In 1911, August 20, Mrs. J. M. Haber found a male and female and their previous nest at Point Lumini. In 1919, Mr. G. Wilson saw it the last week in August.

96. *Dendroica caerulescens* (Gmel.). Black-throated Blue Warbler.

One of the most common warblers of the region. This like the ruby-throated humming-bird likes the yellow-bellied sapsucker's borings.

97. *Dendroica coronata* (Linn.). Myrtle Warbler.

Fairly common about camp in 1913 and 1919, also recorded at Point Lumini in 1911.

98. *Dendroica magnolia* (Wils.). Magnolia Warbler.

Quite common summer resident. Young on wing recorded July 14, 1913.

99. *Dendroica pensylvanica* (Linn.). Chestnut-sided Warbler.

Common. Two nests found July 30, 1913 and July 27, 1919 in small bushes not three feet from the ground.

100. *Dendroica castanea* (Wils.). Bay-breasted Warbler.

Several, apparently migrants, reported from August 26, 1919 onwards.

101. *Dendroica fusca* (Mull.). Blackburnian Warbler.

Not uncommon in the latter part of August when both young and adults are seen. Recorded in 1911, 1913, 1919.

102. *Dendroica virens* (Gmel.). Black-throated Green Warbler.

Common summer resident. In the middle of July, 1913 several families of this species were seen on the wing near camp, on Hardwood road. In 1911, Mrs. Haber found it August 24, at Fox Point. In 1919 it was only once recorded August 7, on Hardwood road.

103. *Seiurus aurocapillus* (Linn.) Ovenbird.

Common summer resident.

104. *Seiurus noveboracensis* (Gmel.). Northern Water-thrush.

Recorded July 7, 1913, at Hardwood lake and later July 20, in an alder near camp. In same place in 1919 a pair recorded most of the summer.

105. *Oporornis philadelphia* (Wils.). Mourning Warbler.

In 1913 quite commonly heard from June 28-July 20. Last record for the season was August 9.

106. *Geothlypis trichas* (Linn.). Maryland Yellow-throat.

Common summer resident in every marshy thicket.

107. *Wilsonia canadensis* (Linn.). Canada Warbler.

A common summer resident.

108. *Setophaga ruticilla* (Linn.) American Redstart.

Common summer resident.

109. *Troglodytes aëdon* (Vieill.). House Wren.

Common on road to Dorset. Recorded at Glenmount, portage railroad of Lake of Bays, at Point Lumini.

110. *Nannus hiemalis* (Vieill.). Winter Wren.

Common resident. No bird song do we more associate with the wild north woods than the fine notes of this songster.

111. *Certhia familiaris americana* (Bonap.). Brown Creeper.

Common summer resident.

112. *Sitta carolinensis* (Lath.). White-breasted Nuthatch.

A few recorded each season. Probably more frequent than our records show.

113. *Sitta canadensis* (Linn.). Red-breasted Nuthatch.

Several seen each season during the summer.

114. *Penthestes atricapillus* (Linn.). Chickadee.

Common summer resident. Most in evidence in August.

115. *Penthestes hudsonicus* (Forst.). Hudsonian Chickadee.

Mr. L. A. Fuertes once recorded it on Little Trout lake, in the summer of 1912.

116. *Regulus satrapa* (Licht.). Golden-crowned Kinglet.

Occasionally recorded in September by those who remain after camp closes (September 1).

117. *Regulus calendula* (Linn.). Ruby-crowned Kinglet.

Recorded several times in first weeks of September.

118. *Hylocichla mustelina* (Gmel.). Wood Thrush.

Several heard or seen each season. Also recorded by Mrs. J. M. Haber in 1911 at Fox Point and Point Lumini.

119. *Hylocichla fuscescens* (Steph.). Wilson's Thrush.

One heard July 11, 1913 on hill to west of road from camp to Dorset. In 1919 on July 22 another record in a deep ravine to left of above road. Also recorded at Huntsville July 1, 1919.

120. *Hylocichla ustulata swainsoni* (Tschudi). Olive-backed Thrush.

Fairly common in 1913 and 1919.

121. *Hylocichla guttata pallasi* (Cab.). Hermit Thrush.

Fairly common summer resident. Not so commonly heard in July. Apparently more common in August. Also recorded August 24, 1911 at Point Lumini and Fox Point (Mrs. J. M. Haber).

124. *Planesticus migratorius* (Linn.). American Robin.

A few around camp. More about Dorset, Glenmount, Point Lumini, Fox Point, Huntsville and more open and populated areas.

122. *Sialia sialis* (Linn.). Bluebird.

Not common. One or two pairs usually recorded nesting near Dorset. Also a few individuals are usually seen in the meadows south of Hardwood lake.

V.—THE MAMMALS.

By A. H. WRIGHT.

These observations are based mainly on the data secured by the author in 1913 when a few small mammals were trapped in spare moments. Interwoven are the accounts of several trustworthy residents, rangers and guides of the region. In this list are thirty-five species, several less than G. S. Miller, Jr.[1] found at North Bay, Lake Nipissing, where he systematically trapped for a month. He found a slight eastward extension of western forms to North Bay, e.g. *Putorius longicauda spadix* Bangs, *Tamias quadrivittatus neglectus* J. A. Allen. Other forms like *Napaeozapus insignis* (Woodland Jumping mouse), *Synaptomys fatuus* (Bang's Lemming), *Sorex fumeus* (Smoky Shrew), *Microsorex hoyi* (Hoy's Shrew), *Neosorex albibarbis* (Marsh Shrew) are yet missing from our list but might well be expected with future systematic collecting. Of use to the author were J. H. Fleming's "The Mammals of Toronto, Ontario"[2] in which are recorded forty-one species and the Manual of Vertebrates by C. W. Nash[3] wherein he records fifty-one species. The new records are to be expected in the shrews, bats and mice.

Condylura cristata (Linnaeus). Star-nosed Mole. "Mole."

The residents report "lots of them in damp soil" and these "dark in color." One was taken about August 1, 1913 on Fletcher's lake but not observed by the authors.

Sorex personatus I. Geoffroy. Masked Shrew.

Common. Several were found dead on the road to Dorset by the authors, G. M. O'Connell and others. Trapped them around Peat Bog, under mossy banks with plenty of roots, under mossy-covered stumps near the roads and trails, in a dark underground cellar under bark, under logs among manure and rotting saw-dust between old lumber buildings.

Blarina brevicauda talpoides (Gapper). Mole Shrew.

Common. Like the preceding not uncommon about buildings where cats bring them without eating them. Trapped around the Peat Bog in tamarack and spruce areas under decaying stumps, and under mossy logs; amongst carpets of Lycopodium in less moist woods. Also taken along the trails and roads.

Myotis subulatus (Say). Say's Bat.

One specimen (C.U. 6700) of this species was taken in the summer of 1913. Only infrequently they were recorded feeding over the Peat Bog from 8 p.m. onwards.

Myotis lucifugus (LeConte). Little Brown Bat.

Not yet taken at Camp Otter, but must be here because of Mr. Miller's record[4] which is "a specimen of this bat (caught) on the platform of the

(1) Miller, G. S., Jr. Notes on the Mammals of Ontario. Proc. Bost. Soc. Nat. Hist., 1897, Vol. 28, No. 1, pp. 1-44.

(2) Faull, J. H. The Natural History of the Toronto Region, Ontario, Canada. Toronto, 1913, pp. 206-211.

(3) Nash, C. W. Vertebrates of Ontario. Toronto, 1908., pp. 83-96.

(4) Miller, G. S. loc. cit., p. 39.

railroad station at Gravenhurst on the evening of August 16. Many others were seen."

Ursus americanus Pallas. Bear.

Some report the "Brown nosed Bear" as not very common. Hardly a season passes but some of the camp encounters the work, tracks or signs of bear. One resident since 1873 said he had seen only one, but that there were quite a few bears in the region. Occasionally some of the parties from camp frighten them from blueberry, huckleberry or blackberry patches, but rarely ever see them.

Canis lycaon Schreber. "Timber Wolf," "Gray Wolf."

Every winter a few packs are reported in this region. At least two killed west of road to Dorset in the winter of 1918-1919. In winter of 1911-1912 a pack of seven were seen on Fletcher lake and a few years before a pack reported east of Otter lake where many deer were more or less snow bound.

Vulpes fulva (Desmarest). Red Fox.

Common. Dnring the summer their signs are frequently found. Many killed with poisoned bait. The red phase predominates in this region though silver grays are reported. Quite a few cross foxes are taken. Some residents doubt local reports of black foxes.

Procyon lotor (Linnaeus). Raccoon.

Not common. Mr. Joseph Allen who had resided at Fletcher lake since 1873 said in 1913 that raccoons were not plentiful. Never knew they were there until five or six years ago." Toward Lake of Bays and southward they report quite a few. They are held to eat berries, fish, nuts, etc.

Martes americana (Turton). Marten. Pine Martin.

A few in the Dorset region. Allen McEachern of Otter lake reports (1913) them "very scarce. Never caught but one. Have seen more signs." Some hold them quite plentiful where timber is heaviest. On Fletcher lake there are quite a few.

Martes pennanti (Erxleben). Fisher.

There are a few in the Dorset region. Fishers are not plentiful about Otter lake. There are more from Hollow lake to and into Algonquin Park. In Fletcher lake region there are far more martens than fishers, and the latter are hard to secure. Arthur Allen, son of Joseph Allen of Fletcher lake took one fisher in the winter of 1911-1912 and another in winter of 1912-1913.

Mustela cicognanii Bonaparte. Bonaparte's Weasel.

Common. This is included by the author on the report of several residents who describe two weasels one quite small and another as large as a small mink. Both are reported great mousers. Some encourage them about the premise for mousing, and maintain they do no damage. One resident said he always had at least one family around his barn and every winter they turned white as do the larger ones also.

Mustela noveboracensis (Emmons) New York Weasel.

Fairly common. I have the head of this species. It was brought in by a cat.

Mustela vison Schreber. Mink.

Common at Otter lake. Have been very plentiful from Dorset to the Park but have been hunted so much they are becoming very shy. They will attempt to capture anything. One day, near camp a mink tried to catch a bathing cedar waxwing.

Mephitis mephitis (Schreber). Skunk.

Common. One or two have been taken at camp.

Lutra canadensis (Schreber). Otter.

There are quite a few throughout this region. In the winter of 1908-1909 two were taken at Otter lake, one 42 inches and another 47 inches in length. Rarely they are seen in winter at the outlet of Otter lake.

Lynx canadensis Kerr. Lynx. "Bobcat." "Lynk."

"There are a few lynx here, these very shy and more of them toward Timagimi country." Another resident speaks of them as "not extra common" and says that "some are caught every year."

Lynx ruffus (Güldenstaedt). "Wild Cat." Bay Lynx.

These are "very scarce, odd." Another reports that he "has seen only one in several years." A wild cat was reported to have been taken in the winter of 1910-1911 at Hollow lake. As yet I can find no certain evidence that both species are present or that the residents really know the two species apart.

Peromyscus maniculatus gracilis (LeConte). Canadian White-footed Mouse.

Common. This is the common mouse of the lumber camps, houses, barns, etc. Trapped most of our specimens under logs. It is generally distributed through the woods.

Evotomys gapperi (Vigors). Red-backed Mouse.

Abundant. Trapped them under and between mossy logs, stumps, in holes at bases of live trees, amongst Lycopodium carpets and occasionally in old abandoned lumber camp buildings. Were particularly plentiful among hemlocks, arbor vitae, and other conifers, yellow birches, etc.

Microtus pennsylvanicus (Ord.). Meadow Mouse. Meadow Vole.

Presumably common in the open fields but very few were taken at Otter lake. Usually found them in the fields around old lumber camps, beneath boards and logs.

Ondatra zibethica (Linnaeus). Muskrat.

The residents hold them plentiful but in midsummer they are not so frequently seen. Each summer a few are observed at Otter lake.

Epimys norvegicus (Erxleben). House Rat.

They are reported to be present in the lower country at Bracebridge. All residents agree they have not seen them about Otter lake or northward and in the years of camp none have been taken around it.

Mus musculus Linnaeus. House Mouse.

We have no records of it at camp nor in its vicinity. Some residents in the Fletcher lake region did not know of them. A few people about Dorset assert they occasionally occur there.

Zapus hudsonius (Zinnermann). "Kangaroo Mouse."

The jumping mouse is not often taken about the camp. On June 30, 1913, we captured two alive in large pits. Most of the residents either do not know them or hold them not very plentiful. Just as in more cultivated regions some of the residents note their particular abundance in hayfields at cutting time.

Erethizon dorsatum (Linnaeus). Porcupine.

Very common. According to some a great nuisance in lumber camps and rangers cabins. They gnaw the tables, leather seats, chairs, wagon seats, belting, etc., yet we believe them persecuted unduly and would hate to see them lost to the north woods.

Marmota monax canadensis (Erxleben). Wood chuck.

Common everywhere. Some of the fire rangers eat the half grown ground hogs. They were about the camp where one semi-tame one near our tent was fed raspberries, bread, and leaves of the basswood, wintergreen, sorrel, and raspberries.

Tamias striatus lysteri Richardson. Chipmunk.

Common about camp, along road to Dorset, in lumber camps, on rocky cliffs, about sphagnum bogs, and in almost any habitat not aquatic.

Sciurus hudsonicus (Erxleben). Red Squirrel.

Common. A great nuisance around lumber camp supplies. One ranger tried to frighten them away with a stuffed porcupine, but it didn't work. Occasionally a wild red squirrel will leap for a person. On road to Dorset one of the authors heard a chase in the thicket beside the road and was surprised to have a red squirrel run for him and leap at his knee. This form is held by all the residents as responsible for the scarcity of black squirrels.

Sciurus carolinensis leucotis (Gapper). Black Squirrel.

Scarce. Once more common in this region around Lake of Bays and southward. Some report it too cold for them while others maintain the species has lost its hold in its struggles with the red squirrels. None of the residents have seen the gray phase. The last black squirrel taken near Otter lake was in October, 1909.

Sciuropterus sabrinus (Shaw). Northern Flying Squirrel.

Reported not uncommon in old stubs. We did not see any alive or skins. On September, 1913, I found the tail of one near a residence and on inquiry the owner said the cats frequently catch them and leave only the tails around the house. The tail vertebrae of the tail I picked up measured 24 mm. or in accord with the measurement for *S. s. macrotis.*

Castor canadensis (Kuhl.). Beaver.

Quite common. The tracks, dams, signs and work of beavers are not infrequent in the outlet of Otter lake, along Ten Mile creek, at Hardwood lake, and throughout the region. One of the most interesting experiences of the camp is to spend a night beside a dam of a beaver colony.

Lepus americanus virginianus (Harlan). Southern Varying Hare.

Very common throughout this region. About the beginning of camp (July 1) the young half grown hares are common about the camp quarters. In one garbage hole 4 feet deep we caught them early in the season (July 2, 1913). Others smaller were caught occasionally by hand. When the last of the councillors leave camp September 15 or earlier these hares have no perceptible change in pelage. Later in late October and early November they get the new white coat. There are no cottontails at Dorset, Otter lake or northward.

Odocoileus americanus (Erxleben). Virginia Deer.

Common.

Alces americanus Jardine. Moose.

Not common. The first year Professor C. V. P. Young began his camp he saw one and every year some one of the camp reports tracks or signs of moose. A resident of Fletcher lake for 40 years said he had shot three or four during that period and that there were a few stray moose in the region. Another reports "odd Moose here and there between the head of Hollow lake and Algonquin Park. All agree there are no caribou *(Rangifer caribou.)*

FURTHER NOTES ON THE ORCHIDS OF HATLEY, STANSTEAD COUNTY, QUEBEC, 1920.

By H. Mousley.

Writing to me last year a correspondent spoke of having had an "orgy" of orchids, and I think the same remark might apply equally well to my experience here at Hatley during the present season, as not content with observing some thirty species or rather more in their native haunts, I have grown most of them successfully indoors, thereby enabling me to more thoroughly examine their wonderful contrivancies for the perpetuation of their species by means of cross fertilization. In passing it may be remembered that it took the scientific world just over one hundred and seventy-five years before this interesting problem of cross fertilization was fully understood or known. It was Nehemias Grew who first announced to the world in 1682 that it was necessary for the pollen of a flower to reach the stigma in order to insure the fruit. After this announcement came a period of over fifty years of discussion and scepticism amongst the leading lights of the botanical world, until Linnaeus in 1735 reaffirmed the fact and proved beyond further doubt that Grew was right. But this was only part of the secret, and it took another fifty years or more, or until 1787, before Christian Conrad Sprengel a German botanist and school-master essayed to explain how certain plants whose particular construction prevented their pollen from reaching the stigma in the usual way were fertilized. He announced the startling fact that they were fertilized by means of insects, but here again like his predecessors he had seen but half the secret, and it remained for Charles Darwin in 1857-58 to read the riddle aright.

Sprengel started out to prove that insects fertilized a flower by brushing the pollen from the anthers by various hairy parts of their bodies, and in their motions conveyed it to the stigma. Difficulties, however, soon confronted him, in the shape of certain plants whose pollen and stigma matured at different periods, and therefore could not be fertilized in the manner he had declared, and thus unknowingly, within an ace of the goal, his theory broke down, and it took a further period of seventy years of controversy and investigation, before Darwin was able to show, that cross fertilization by insects, and not insect fertilization alone, was the fundamental plan involved in floral construction.

To return, however, it will no doubt be remembered that it has always been my ambition to place Hatley in the very first rank as an ornithological, entomological and botanical El Dorado, and I now think in so far as regards the latter, there is no place in Eastern North America, with the exception of one, that can show such a list of the family Orchidaceae as Hatley. In my last paper on the subject "The Canadian Field-Naturalist," Vol. XXXIV, 1920, No. 3, pp. 44-47, I pointed out that so far as I was aware my only rival was Fairlee in the State of Vermont, with a list of thirty-three species and varieties, against mine of thirty, thus leaving me three behind, which I was determined to try and make up this year by covering further new ground. In this I have been successful, Hatley thus tieing with Fairlee for first honours, i.e. unless Dr. Denslow has discovered any fresh species also. My additions are the Small Round-leaved Orchis, *Orchis rotundifolia*, Hooker's Orchid, *Habenaria Hookeri*, and the Rose Pogonia, *Pogonia ophioglossoides*, the adding of the first and last named, however, necessitating my going outside the four square miles radius, both of them having been found at a distance of fifteen miles from my house. As an offset against this I have discovered many new stations for most of the other species, all of which I think with the possible exception of *Calypso bulbosa* could now be found within a radius of three square miles. Even as recently as September 9 I found two new stations for *Habenaria macrophylla* within fifteen minutes walk of my house. Three of the plants had flowered and were in fruit, their respective heights being 59, 52 and 50 cm., whilst their withered spurs with bends even then measured 3.5 cm. in length and over, with leaves from 17.20 to 19.75 cm. in width. Thoreau in his "The Maine Woods," p. 297, speaks of a large plant he specially measured on July 27, 1857, as being 61 cm. in height, with leaves 24.25 cm. long and 22.80 cm. wide, which by its size was possibly referable to this species and not *orbiculata*. As already indicated it has indeed been an exceptionally interesting season, for not only have the three new species mentioned been added to the list given in my last paper, but much further valuable information has been gained with regard to the distribution of most of the other species. The lovely little *Calypso* (of which I was fortunate in finding one plant with white petals and sepals, and another with cream coloured ditto) as usual was the first to appear, being in full bloom on May 25, followed quickly by the Smaller Yellow Lady's Slipper, *Cypripedium parviflorum*, on May 30, and the Showy Orchis, *Orchis spectabilis*, on June 3. The last named has never been an abundant species, and only two or

three plants have ever been found together, although scattered over a wide area, but this year a new station was discovered on the eastern shore of Lake Massawippi, where clusters of from ten to twenty plants were found in full bloom, thus making a most charming picture. The other much rarer member of this family the Small Round-leaved Orchis, *Orchis rotundifolia*, and one of the three new species discovered this season will be dealt with hereafter in an annotated list as before. The opinion expressed in my first paper "The Ottawa Naturalist," Vol. XXXII, 1919, No. 8, p. 145, regarding the Large Yellow Lady's Slipper, *C. parviflorum* var. *pubescens*, has not matured, and I can now safely say that over the ground I have ranged, it is by far the rarest of the two Yellow Lady's Slippers. Two new stations were discovered for the Showy Lady's Slipper, *C. hirsutum*, and on its old ground it was just as abundant as last year, but only one plant was seen having three blooms. Perhaps one of the pleasantest thrills experienced, was the finding on June 26 of a new station near Barnston for the Pink Lady's Slipper or Mocassin Flower, *C. acaule*, where the species was in great profusion, and amongst the lovely pink blooms were innumerable snowy white ones forming a delicious contrast.

Of the Habenarias one new station was found for the Northern White Orchis, *H. dilatata*, where the plants were exceptionally fine, but no examples of the var. *media* were met with, although a special search was made for them. Three plants only of the Large Round-leaved Orchis, *Habenaria orbiculata*, were found in bloom, the height of these respectively being 38, 33, and 25.50 cm., much below those of *macrophylla* already given, whilst the length of the spurs did not exceed 2.50 cm. Of the two species *orbiculata* seems to be the rarer, although only five plants of *macrophylla* were actually found in bloom, still the number of flowerless ones of the latter, greatly exceeded those of the former. *H. Hookeri* one of the new species will be dealt with hereafter in the same manner as *O. rotundifolia*. The most interesting member of the family, however, was x *H. Andrewsii*, which was discovered here last year, and of which I have had the good fortune to find several more examples this season, but these it is hoped to make the subject of a separate paper later on. The ground on which I found my Large Purple Fringed Orchis, *Habenaria fimbriata*, last year, has since been trampled out of all recognition by a herd of young stock, and not a single plant could be found, but I located a few elsewhere. With regard to this species and *H. psycodes* much uncertainty appears to exist regarding the precise point where the one leaves off, and the other begins. In this connection I have seen plants with lips 1.8 c.m. in width, whose height and size of leaves, however, would hardly come up to some people's idea of *fimbriata*. The Grass Pink, *Calopogon pulchellus*, of which only four examples were found last year, was I am glad to say much more in evidence this season, the little station producing twenty-two plants which were still in bloom when I visited it on August 1. I had previously, however, on July 10, found a much larger station for it near Beebe, some fifteen miles away. It was at this station that I also came across the Rose Pogonia, *Pogonia ophioglossoides*, growing in company with *Calopogon*, but as this forms one of the three new species, it will be dealt with hereafter in the same manner as the others. In the Magdalen Islands *Calopogon* grows as thickly as grass so Bro. Marie Victorin tells me, but only attains a height of five inches!, an instance no doubt of habitat and environment similar to that of *Spiranthes Romanzoffiana* to be mentioned later on.

Arethusa or the Indian Pink, *Arethusa bulbosa*, may be said to have been one of the surprises of the season, two new stations having been found for it, in one of which it was in the utmost profusion, one almost white bloom appearing very conspicuous amongst the rest.

The Wide-leaved Ladies' Tresses, *Spiranthes lucida*, still holds its own as the rarest member of this family in these parts, in fact it is the rarest orchid here, only the one specimen mentioned in my first paper having so far been found, and out of the 33 species enumerated it is the only one I have failed to find again this season. In point of numbers the Slender Ladies' Tresses, *S. gracilis*, ran it very fine last season, for only three plants of that species could be found but this year I am glad to say some half-dozen more were located on the same ground. As illustrating the difference that environment can make in the growth of a species, a colony of the Hooded Ladies' Tresses, *Spiranthes Romanzoffiana*, growing on very dry ground could only attain an average height of 8 cm., as against 29 cm., the average of that of another colony growing on very wet ground. Of the Rattlesnake Plantains it is just possible that four plants I came across in fruit on September 3 may eventually turn out to be Menzies Rattlesnake Plantain, *Epipactis decipiens*. Certainly their spikes seemed more one-sided and denser than is usual with *tesselata*, and the locality was a new one, but outward appearances are often deceptive, and I think for this reason it will be best to leave the matter in abeyance for the present, and wait until next year, when it is hoped the plants may still be in existence, and will flower again. The Lesser Rattlesnake Plantain, *E. repens* var. *ophioides*, and *E. tesselata* were scarcer I thought than usual. In "Rhodora," Vol. XIX, 1917, p. 38, there is a short note by Mr. H.

W. Child, entitled "Some Traits of Epipactis in Vermont," in which the author draws attention to the fact, that in Vermont when examined in living specimens, the sepals both lateral and dorsal of *E. pubescens* as it comes into flower, are definitely tinged in the centre with a green colour, those of *E. tesselata* with a rose colour, whilst those of *E. repens* var. *ophioides* are pure white. As regards the two last named I can fully bear out Mr. Child's findings in Vermont, for the same thing occurs here at Hatley, and in the case of *tesselata*, so much so, that many of the racemes might be described as rose pink. Those of *repens* var. *ophiodes* on the other hand I have never found to be anything but pure white. Of the Coral Roots the Early one, *Corallorrhiza trifida*, was everywhere, but the Large one, *C. maculata*, is far more restricted. The only station I discovered for it last year produced very few examples this season owing to the ground being covered with spruce trees which had been cut down for pulpwood, and although another station was found near my house, it contained only two plants, and none could be found on the ground at the roadside to the northeast of the village shown to me late in August of last year. Although the Green Adder's Mouth, *Microstylis unifolia*, has been described to me as a weed in New Brunswick, I can hardly say the same of it at Hatley, nevertheless my experience this year warrants the statement that it is a very generally distributed plant growing almost everywhere, but usually only in comparatively small numbers. Its cousin the White Adder's Mouth, *M. monophyllos*, still holds its own as a rarity, for although two more stations have been located, making a total in all of four, three of them can only boast of holding some two or three plants each, whilst on the remaining or fourth one, it would probably be hard to find more than a dozen or so. Loesel's Twayblade, *Liparis Loeselii*, I find is quite generally distributed, especially wherever wet places occur on the sides, or at the foot of hills, and here several new stations for it have been found.

And now I must say a few words regarding the great Brulé Bog, near Waterville, of which mention was made in my last paper, and to which a trip in company with my friend, Mr. Ludlow Griscom was contemplated this season. This trip eventually came off on June 23, with results anything but what we had expected. No new orchids were discovered, and had it not been for some interesting species of *Carex*, the trip might almost be said to have been a blank. The cause of this disappointment seems entirely due to a fact we had overlooked in the fall of last year, i.e. the digging of some deep drains, which are no doubt sapping the life out of this bog, in fact it can no longer be considered a bog in the true sense, for on the day we visited it, the fact of getting one's boots thoroughly wet seemed somewhat remote. All one did was to walk on a springy bed of dry sphagnum and low shrubs, which was tiring in the extreme. In the woods surrounding the bog, however, damper conditions prevailed, and here the following orchids were found during our two visits, viz.: *Cypripedium acaule*, *Habenaria hyperborea*, *H. obtusata*, *Spiranthes Romanzoffiana*, *Epipactis repens* var. *ophiodes*, *Listera cordata* and *Corrallorrhiza trifida*.

Fortunately for our dejected spirits, I had heard of another famous bog and swamp situated near Beebe, a village some fifteen miles to the southwest of Hatley as the crow flies, and thither we resolved to go on the following day, as I already possessed a pressed specimen of the Rose Pogonia, *Pogonia ophioglossoides*, which had come from there, and this alone was an inducement to me to visit the place, as the species was new to my list. Rising early the next morning (June 24), we made a start by car in anything but propitious weather. However, this gradually improved, and shortly after passing Burrough's Falls, we were cheered by the sight of a Bartramian Sandpiper, *Bartramia longicauda*, standing prominently on a large stone in the centre of a field adjoining the road. This bird I had not seen for seven years and I remarked to my friend that it must be a good omen, and so it proved to be as will be seen hereafter. Fortunately I was acquainted with the owner of the land on which the swamp was situated, and after calling on him and obtaining all particulars as to its exact location, we were able to enter it at the most convenient place, and without loss of time. Almost at once it became evident that this time we had indeed struck a veritable El Dorado, and neither of us I think are likely to soon forget that pleasant damp swamp, with the treacherous little bog at the end of it. The ground was covered with a growth of cedar, spruce and tamarack, with nice open spaces scattered about and everywhere was the wet cool sphagnum moss, amongst which no less than ten different orchids were found at this date, and later in July another was added to the list. Now as already stated the primary object of the visit was to take *Pogonia ophioglossoides* but this could nowhere be found, and I came to the conclusion that we were too early for it which seemed to be borne out when later in the day two solitary plants of *Calopogon pulchellus* were found in bud only, this species usually appearing about the same time and in the company of *Pogonia*. Now late in the afternoon we had wandered down to the small bog at the southwest end of the swamp, and it was whilst returning from there that we decided to work another piece of ground hitherto unexplored before finally leaving for home. Hardly had we commenced a systematic

search, before Mr. Griscom who was slightly in advance, quite casually called my attention, by saying, look at this small orchid. Now this seeming sang froid on the part of my friend, was nothing more or less than a well-feigned piece of acting, for there before me was a specimen of that little gem the Small Round-leaved Orchid, *Orchis rotundifolia*, which neither of us had seen before in nature, and the sight of which had elated him quite as much as it did me. Of course the usual congratulations ensued, and as the Bartramian Sandpiper had been the beginning, so this rare little orchid was the ending of a perfect day. Of the other species found the following is a list, viz.: *Cypripedium parviflorum*, *C. hirsutum*, *C. acaule*, *Habenaria hyperborea*, *H. obtusata*, *Calopogon pulchellus*, *Arethusa bulbosa*, *Listera cordata*, *Corallorrhiza trifida*, and later on in July *Pogonia ophioglossoides*. Although many of them were nearly over or on the wane at Hatley at this date, here in this delightful cool swamp lying at an elevation of about 700 feet or rather more above sea level, they were in the pink of condition. The first named as well as *Arethusa* were in the utmost profusion the perfume from them being delicious, and it is unlikely we shall ever see the sight equalled again, unless it is in this same swamp. The Showy Lady's Slipper, *C. hirsutum*, was not out at this date, but I have been told that it used to be very plentiful at one time, but vandalism of the worst kind has much depleted its ranks. However, it still seemed to be in fair numbers on July 10, the date of my second visit. Other flowers that could hardly escape attention, as they were all over the place, were, Buckbean, *Menyanthes trifoliata*, and False Solomon's Seal, *Smilacina stellata*, and that curious little insectivorous plant the Round-leaved Sundew, *Drosera rotundifolia*, was found in a few places whilst gathering specimens of *Carex tenuiflora*, a somewhat uncommon sedge. What this swamp with the higher woods immediately surrounding it will eventually produce none can say. The latter we were entirely unable to explore, and work has yet to be done during May, early June, late July, August and September, before any adequate opinion can be formed. Under the cedars where I found *Listera cordata* seemed a likely enough place for *Calypso bulbosa*, and who knows but what *Cypripedium arietinum* might not be there also. The higher woods should produce some more of the Habenarias, perhaps *Hookeri* and *orbiculata*, but there, further speculating must not be indulged in, time alone will show. The birds were not entirely forgotten, the Northern Parula Warbler, *Compsothlypis americana usnea*, and the Golden-crowned Kinglet, *Regulus satrapa satrapa*, being noted, both of which were evidently breeding, as well as the Brown Creeper, *Certhia familiaris americana*, and the Olive-sided Flycatcher, *Nuttallornis borealis*.

Amongst all this galaxy of beauty and profusion, a vein of regret was struck, when I came to realize that my conquests were fast drawing to a close, and that ere long it would be well nigh impossible to add another new species to my list. Certainly there is still a possibility of finding any of the following, viz.: *Cypripedium arietinum*, *Habenaria dilatata* var. *media*, *H. clavellata*, *H. blephariglottis*, *H. lacera*, *Serapias helleborine*, *Epipactis decipiens* and *Listera auriculata*, a total of eight only, but out of these *C. arietinum* and *Serapias Helleborine* are very rare indeed, and are hardly likely to fall to my lot. Still there is plenty of ground to cover yet, and one never knows what a turn in the road may mean, perhaps some overlooked little wood, swamp, or bog, where hidden away lies some rarity, and herein lies the charm of orchid hunting.

In conclusion the following is an annotated list of the three new species found this season, viz:

Small Round-leaved Orchis, *Orchis rotundifolia*, Banks. This rare little orchid which was once aptly described to me by a lady friend as a beautiful little spike of tiny opalled flowers, was first discovered on June 24 near Beebe, a village lying to the south east of Hatley, and distant about fifteen miles as the crow flies. The colony was a very small one, consisting of some half dozen plants only, but when visited again on July 10, three or four more (one in perfect bloom even at this late date) were found in the immediate neighbourhood of the others. With more time at one's disposal to enable a thorough systematic search to be made (the area of the swamp being considerable) it is hoped to find it in greater abundance another year. The location was an old and somewhat grown up logging road, in the centre of which, and at the sides, the plants were growing.

Hooker's Orchid, *Habenaria Hookeri* Torr. The home of this orchid lies on the eastern shore of Lake Massawippi, between the railway station of that name, and Perkin's Point. There I found several small colonies of it in bloom from as early as May 30 to as late as June 25, when it was beginning to get over. It is a fallacy to suppose (as many of the books would have us believe) that the leaves of this orchid in contra distinction to those of *H. orbiculata* are always raised above the ground, and for this reason the plants when not in flower can be distinguished from the latter. There is really no absolute means of distinguishing *Hookeri*, *orbiculata*, or *macrophylla* from one another when in leaf only, as I have found all three of them at one time or another, with leaves raised above, and also lying flat on the ground. Even when the scape is partly developed one may be deceived, but *Hookeri* is

usually ebracteate, and so can be distinguished with tolerable certainty from the other two, on whose scapes there are always bracts.

Rose Pogonia, *Pogonia ophioglossoides* (L.) Ker. This delicately coloured orchid although known to have been found in the large swamp near Beebe as already mentioned, was not in bloom when we visited it on June 24, but I was fortunate to secure it on my second visit on July 10, although even then it could hardly be said to be fully out, although its companion *Calopogon pulchellus* apparently was. Both these species were found principally on the outskirts of the little bog at the far end of the swamp where the Small Cranberry, *Vaccinium Oxycoccos*, grew in profusion. Of *Pogonia*, only about a dozen or more plants were in bloom, whilst of *Calopogon*, there were probably about three times as many, so the station apparently is not a large one for either species.

FURTHER NOTES ON THE RHOPALOCERA OR BUTTERFLIES OF HATLEY, STANSTEAD COUNTY, QUEBEC, 1920.

BY H. MOUSLEY.

After a storm there usually comes a calm, and so after a year of plenty there usually follows one of scarcity, at least I have generally found it so with the butterflies, and this year has certainly proved no exception to the rule.

Reverting for a moment to my previous paper in "THE CANADIAN FIELD-NATURALIST," Vol. XXXIV, 1920, No. 1, pp. 7-10, it will be found that the species there recorded for Hatley numbered forty-five. To this total can now be added another three, the Mountain Silver-spot *(Argynnis atlantis)*, the Brown Elfin *(Incisalia augustus)*, *and the* Coral Hairstreak *(Strymon titus)* which latter I find has been taken by Mr. George A. Moore at North Hatley. See "A Preliminary List of the Insects of the Province of Quebec," A. F. Winn, 1912, p. 15.

At first sight this result may appear a very poor one, but in reality it is about as much as can now be expected in any one season, the time having arrived (the same as with the orchids) when it is going to be a matter of much difficulty to add to one's laurels, the final goal having been about reached in both cases. As regards the Mountain Silver-spot it could without doubt have been added to my list long ago had not other interests taken up all my time, and prevented me from paying more attention to the genus *Argynnis*, a difficult one, and of which *atlantis* is a member. It occurred in some numbers near Mount Orford about eighteen miles to the northwest of Hatley during the present season (1920) so Mr. Winn tells me, and to whom I am indebted for specimens, which enabled me to see that a few examples I had placed on one side as doubtful *aphrodite* were in reality *atlantis*. The little Brown Elfin I first came across on June 8, when visiting the great Brulé Bog near Waterville, some thousand acres in extent, and judging from its worn condition on that date, it must have been on the wing for about a fortnight. The next time it was met with was on June 20, when visiting another small bog (for the first time) two miles to the north of the village, and then again four days later it was found in a large swamp near Beebe, a village some fifteen miles to the southwest of Hatley, so that this little Hairstreak seems fairly well distributed wherever bogs are in evidence, its larvae feeding on sheep laurel and blueberry, which are usually found in such places. In the first named locality it was in great profusion principally on the edges of the woods bordering the bog, but in the other two it was not nearly so plentiful, probably owing to the much later date and its being nearly over.

Returning to the subject of the general scarcity of butterflies, the only species that could compare in point of numbers with former years were the two large Fritillaries, *Argynnis cybele* and *A. aphrodite*, and these literally swarmed again, in fact, I have never known a season in which they did not. Several of the small skippers were in goodly numbers as well as the Spring Azure, more examples of the form *lucia* being seen than previously. The Arctic skipper, *Carterocephalus palaemon*, was located again in small numbers, not only at Hatley, but also in the large swamp near Beebe already referred to. The Black Swallow-tail, *Papilio polyxenes*, regained its normal position, but the Monarch, *Danaus archippus*, again failed to put in an appearance, although ten examples of its counterpart the Viceroy, *Basilarchia archippus*, were seen at various times between June 12 and August 28, quite an unprecedented number. The little Wanderer, *Feniseca tarquinius*, kept up its apparent record for rareness, only one example being seen on June 14. Of the genus Polygonia which was so plentiful last year, very few ex

amples were seen, in fact, not one of the handsomest the Violet Tip, *Polygonia interrogationis*, and of the Green Comma, *P. faunus*, recorded by Gosse in 1835-38 it still remains unchecked, although I see it has been taken at East Bolton eighteen miles to the west of Hatley see ("A Preliminary List of the Insects of the Province of Quebec," A. F. Winn, 1912, p. 13.)

Of the smaller Fritillaries, *Nycteis* was better represented and seems more generally distributed than I had hitherto imagined. Harris' Checkerspot, *Melitaea harrisi*, on the other hand appears to have entirely died out from the one meadow where I used to find it, as repeated visits again this season failed to reveal its presence. The Pearly Eye, *Enodia portlandia*, as in the days of Gosse kept up its reputation for rareness, as I only saw four examples of it during the month of July. The two Hair-streaks, the Acadian, *Strymon acadica*, and Striped, *Strymon liparops*, were found in their usual haunts on the roadside, but since then all the shrubs have been cut down and burnt, so that next year may witness a great scarcity, if not total extermination of these two species. Hunter's butterfly, *Vanessa virginiensis*, which during the past two years has been unusually plentiful has not been seen at all during the present season, and the same remark applies almost equally well to the Painted Lady, *Vanessa cardui*, although I did see one fresh example on October 7. Of the American Tortoiseshell, *Aglais milberti*, only a few examples have been noted, although at one time a season never went by without its larvae being found on a bed of nettles near my house, but of late years none have been seen.

In conclusion as last year went down to posterity in these parts at all events as a record entomological one, so will this one equally do so, but not for abundance, and it is a matter of congratulation to think that I had other researches in hand which kept my time fully occupied.

OBITUARY

CHARLES GORDON HEWITT

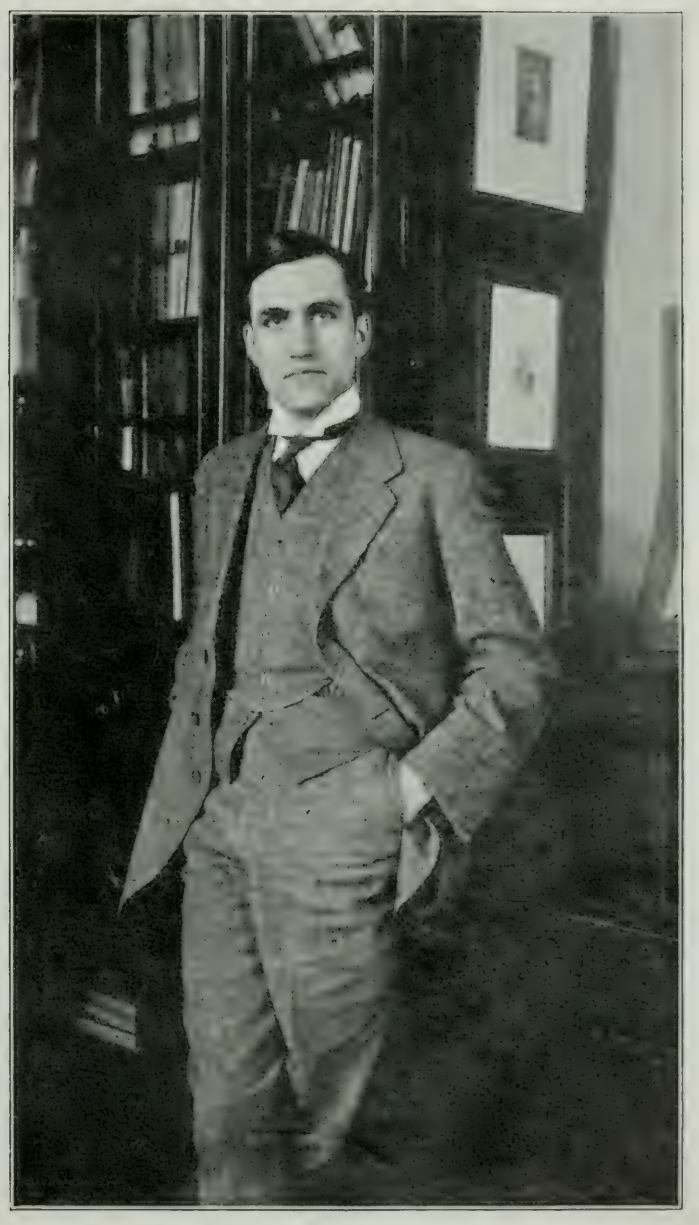
Science has lost several able men during the last few years and the Ottawa Field-Naturalists' Club has been deprived of more than one leader of international reputation. Such were the two Macouns and Lawrence M. Lambe and now to these is added C. Gordon Hewitt, late Dominion Entomologist and Consulting Zoologist.

Dr. Hewitt was born and educated in England and before coming to Canada had taught zoology in the University of Manchester. Accepting the position of Dominion Entomologist soon after the death of Dr. James Fletcher, he came to Canada in the fall of 1909 to take over the new work. His task, at that time, was by no means an easy one as his predecessor had set a very high standard and had, moreover, been highly esteemed by all who knew him. To follow successfully in such footsteps required unusual ability which the new chief was soon found to possess. Fletcher had been hampered by holding the dual position of Entomologist and Botanist, through lack of assistants and inadequate quarters. Under the new arrangements the departments were separated and slightly more space became available.

Dr. Hewitt proved to possess marked executive ability with which he combined a diplomacy that awakened friendly envy among his colleagues of other departments. Within a few years the Division of Entomology had been developed into a separate branch of the Department of Agriculture with a network of field laboratories extending from the Atlantic to the Pacific. Thus at the time of Dr. Hewitt's death some ten years after he took office, the Entomological Branch contained no less than 63 members, four divisions and maintained twelve field laboratories, with trained officers in charge whose business was to study local insect problems. In addition an efficient quarantine had been inaugurated against the importation of foreign pests. Such is a brief summary of the advancement achieved under Dr. Hewitt's direction.

In addition to Entomology, Dr. Hewitt took a keen interest in kindred sciences, more particularly ornithology, a practical demonstration of which may be recalled in the important Migratory Bird Treaty between the United States and Canada in which Dr. Hewitt, as Consulting Zoologist took a leading part for the Canadian Government. He also entered enthusiastically into the question of establishing bird sanctuaries and did much to create an interest in the erection of bird nesting boxes in the vicinity of Ottawa.

Towards the last he had turned his attention to studying means for the control of predatory mammals and at the time of his death had accumulated a mass of evidence to favor a scheme for suppressing such pests.



C. Gordon Hewitt.

Dr. Hewitt was the recipient of many honors from scientific societies; he was a past president of the American Association of Economic Entomologists, of the Entomological Society of Ontario and the Ottawa Field-Naturalists' Club; a Fellow and Treasurer of the Royal Society of Canada, etc., etc. The gold medal of the Royal Society for the Protection of Birds was presented to Dr. Hewitt in March, 1918, in recognition of his services in furthering the Migratory Bird Treaty between the United States and Canada. He wrote more than a hundred papers on scientific subjects, the best known being his book on the House-fly. A book on Wild Life in Canada is in course of publication at the present time.

Dr. Hewitt was married to Elizabeth Borden, daughter of late Surgeon General Sir Frederick Borden, of Canning, Nova Scotia, in whom he found a ready helpmate and an inspiration for the work he had so much at heart.

His untimely death, on February 29th, 1920, at the age of 35, closed a career of marked achievement and one of great future promise. The loss to the Entomological Branch is one that only those in close touch with the work can estimate, but the foundation for future progress has been well laid so that those who follow can confidently build upon the structure so ably begun.

NORMAN CRIDDLE.

A more detailed obituary notice prepared by Arthur Gibson and J. M. Swaine, was published in the May, 1920, issue of the Canadian Entomologist, together with a list of the writings of the late Dr. Hewitt, compiled by C. B. Hutchings.

JOHN MACOUN MEMORIAL.

At the request of naturalists generally throughout Canada, the Ottawa Field-Naturalists' Club has decided to receive subscriptions for a permanent memorial in honour of the late Prof. John Macoun, Naturalist of the Geological Survey of Canada, who died at Sidney, B.C., on July 18, 1920.

The wide field of natural history work to which John Macoun devoted his life is well known, not only throughout Canada but in other countries as well. He specialized particularly in botany and was the founder of the Canadian National herbarium. Other sciences, however, specially zoology, were also greatly enriched by him; he will always be remembered as a great pioneer in Canadian natural history.

Many friends of the late John Macoun, particularly in Toronto and Ottawa have thought that the memorial should take the form of a painted portrait to be hung in the Victoria Memorial Museum. Such a memorial has now been decided upon and a painting will be made by Mr. Franklin Brownell of Ottawa, the well-known portrait painter. Expenses in connection therewith will be about $700.

Subscriptions to this fund should be forwarded to Mr. Arthur Gibson, Dominion Entomologist, Ottawa.

Should the list be oversubscribed arrangements may be made whereby those subscribing above a certain sum, which now cannot be defined, will receive a reproduction of the painting. A list of those who subscribe will be published in the Canadian Field-Naturalist.

A.G.

REVIEWS.

THE AUK FOR 1920, VOL. XXXVII.

During the year 1920 the following titles of interest to Canadian ornithologists, either for authorship or subject matter, have appeared:—

NO. 1. JANUARY.

In Memoriam: William Brewster, born July 5, 1851, died July 11, 1919. By Henry Witherbee Henshaw, 2 plates, pp. 1-23.

William Brewster—An Appreciation. By John George Gehring, pp. 24-28.

Wm. Brewster, the Dean of American ornithology was probably better known personally to the past than to the present generation of Canadian naturalists. He largely influenced Canadian ornithology through Vennor, Chamberlain, Boardman, McIlwraith, &c., even to the present generation of those fortunate enough to know him. The rest of us know his writings and the affection with which he was generally regarded through which he still lives. Funds for a Brewster Memorial have been raised by subscriptions from both sides of the line. This is to take the form of a gold medal to be awarded semi-annually for outstanding work on birds of the Western Hemisphere. It is in keeping that the medal has been designed by Brewster's life-long friend, Daniel C. French, the sculptor.

The Status of the Subspecific Races of *Branta canadensis*, by J. D. Figgins, pp. 94-102.

This paper was suggested by H. Swarth's monograph on the subject (Cont. from Mus. Vert. Zool. Univ. of Cal.) It is proposed that *huchinsi* and *occidentalis* be dropped as recognized sub-specific races of the Canada Goose and be regarded as hybrids between *canadensis* and *minima*, the latter being raised to full specific status. Remarks on this proposal will be found farther along in these reviews.

The Thirty-seventh Stated Meeting of the American Ornithologists' Union. By T. S. Palmer, pp. 110-125.

This was held Nov. 10-13, 1919, at the American Museum of Natural History, New York. Canada was well represented by three Fellows, one Member and two Associates. 247 Associates were elected, 14 of them from Canada.

In General Notes, p. 145, Jonathan Dwight under the heading, Nomenclatural Casuistry, takes exception to H. C. Oberholser's (Can. Field Nat., XXXIII, pp. 48-50) founding the name of his new race of Red-headed Woodpecker on an acknowledged *lapsus calami*. The use of the specific term *erythropthalmus* instead of *erythrocephalus* in the original citation upon which Mr. Oberholser bases his name is plainly an error missed by the proof-reader. It is absurd to regard it as a serious nomenclatural fact. Such pedantic adherence to the letter of the law of priority should be discouraged.

Under Recent Literature,—

The Birds of Eastern Canada, by P. A. Taverner, is reviewed, pp. 147-149. As much commendation as the work is entitled to is given. Amongst the minor criticisms made by W. S. is but one on which the present writer would like some light. Mr. S. objects to the author's use of the term "type form, race or subspecies" as applied to the first described group of a given species. It would be gratifying to know how better to express the idea. Whilst first described races have no taxonomic superiority over those discovered later they have nomenclatural priority and as such are often to be referred to. It is unfortunate that the word "type" and "typical" have been given restricted and specialized meanings in zoology. The development of scientific concepts has twisted them from their obvious meaning and deprived us of very valuable words in their ordinary sense.

The Status of *Larus hyperboreus barrovianus*, by H. C. Oberholser. Proc. Biol. Soc. Wash., Vol. 32, pp. 173-174, reviewed p. 166.

It may be remembered that this author lately advocated the revival of the Point Barrow Gull as a recognizable subspecies of the Glaucuos Gull and that Dr. Dwight in a paper referred to in the previous volume of this journal advanced strong evidence to the contrary. This paper continues the argument. It resolves itself into the old question of what is a subspecies nad upon how fine distinctions it can be founded. The writer has examined a considerable number of these north-western birds and recognizes that they do average smaller, though with so much individual variation and so many exceptions that few birds can be recognized with certainty without a knowledge of their geographical origin. It is a matter of opinion whether such races are worthy of nomenclatural recognition.

Under Notes and News,—

P. 186 is a brief report on the size and scope of the bird collections of the Victoria Memorial Museum, Ottawa.

P. 187 is a note on the progress of the Reports of the Canadian Arctic Expedition, 1913-18. As far as birds are concerned only a part on bird parasites *(Mallophaga)* and a few scattered identifications of invertebrate forms in bird stomachs have appeared, but Dr. R. M. Anderson expects to get the reports on Birds and Mammals out as soon as the pressure of his duties as editor of the whole series permits.

P. 188 informs us that the Museum of Vertebrate Zoology of the University of California has received from Miss Annie Alexander an endowment of $200,000 for its maintenance. This institution has done in the past, and will do in the future, much valuable work within our borders in the course of its survey of west coast conditions. It is a matter of satisfaction on both sides of the line that the future usefulness of this able institution is assured.

NO. 2. APRIL.

Additions to the Avifauna of the Priblof Islands, Alaska, including Four Species New to North America, by G. Dallas Hanna, pp. 248-254. Mr. Hanna's residence upon these lonely oceanic islands has given him unusual opportunities for studying their bird life. Close to the dividing line between America and Asia, where the New and the Old Worlds come most nearly into contact, he has collected and observed many Old World stragglers and probably has added more species to our Check List than any other living man. The greatest importance of these technical additions to our avifauna lies in the possibility of their occurrence south along the continental coast and in suggesting species to be looked for there.

The Subspecies of *Branta canadensis* by H. S. Swarth, pp. 268-272. In this paper the perplexing subject of the Canada Goose and its races comes

up again. Mr. Swarth akes exception to Mr. Figgin's article, mentioned previously in these reviews, both in treatment and substance. He does not agree to the proposal for regarding *hutchinsi* and *occidentalis* as hybrids between two species, *B. canadensis* and *B. minima*, and, basing his study on fuller breeding data, seems to have the best of the argument. With Mr. Swarth we agree that there is a north-west coast form with well-marked color characteristics. Whether *occidentalis* can be applied to it is not perfectly clear. Unfortunately, as Mr. Swarth states, the type specimen on which that name is founded is one of those puzzling nondescript, perhaps abnormal, birds that are not easy to fit into present recognized divisions. This is a good example of the founding of supposed new races on too few specimens, and the danger of setting up freaks or intermediates as types. In spite of all this discussion the relatcinships of the various forms of the Canada Goose can hardly be said to be settled, nor is it likely that they will be until we can establish the essential characters of the various geographical breeding groups. We will then have definite standards for the comparison of the heterogeneous flocks that are met with in migration. In the meantime, species and subspecies derived from mixed migrants are as likely to be arbitrary groupings of characters as racial divisions.

Plumages of Gulls in Relation to Age as Illustrated by the Herring Gull *(Larus argentatus)* and Other Species. By Jonathan Dwight, 5 plates, pp. 262-268.

If the geese of the genus *Branta* are in confusion still worse is the state of the gulls of the genus *Larus*. This paper traces out the age sequence of the gulls, taking the Herring Gull as an example, and details the successive plumage characters from birth to maturity, with plates of wing and tail details of each stage. Dr. Dwight concludes that it is not until the fourth winter plumage that all traces of juvenility are lost, making a four year plumage cycle. He closes his paper with lists of all American gulls in two, three and four year plumage cycle groups. This is a most valuable paper, and one that prepares for the foundation of a proper understanding of these puzzling birds.

Fifth Annual List of Proposed Changes in the A.O.U. Check-list of North American Birds. By Harry C. Oberholser, pp. 274-285.

Perhaps it is well for Mr. Oberholser's reputation with the general public to state that these are compilations of suggestions by all authors, and that he is not quite the iconoclast that the title might suggest. The list is a staggering threat against our stable (?) scientific nomenclature. There are about a hundred proposed changes and twenty rejections and eliminations. We cannot expect that finality can ever be reached in any scientific subject, philological or zoological, but our greatest comfort in inspecting this one year's record of changes is that it is only proposed and not an accepted fact.

Under General Notes,—

Dr. J. C. Phillips, pp. 289-291, describes Habits of the Two Black Ducks, and records differences in the winter distribution and habits of the two much debated subspecies of Black Duck, *rubripes* and *tristis*, that go far to substantiate the validity of the distinction we make between them.

Geo. H. Stuart, p. 292, records the breeding of the Greater Yellow-legs in the vicinity of Grand Lake, Newfoundland, June 20, 1919.

W. E. Saunders, pp. 304-306, gives us Additional Notes on the Birds of Red Deer, Alberta. This constitutes an addenda to the writer's Birds of the Red Deer River, Alta. (*Auk*, 1919). It gives observations on 31 species, and adds seven to the list of that section.

Under Recent Literature is noted a paper On the Protection of Birds in the Province of Quebec, by F. Gaguin, *Reveue Française d'Ornithologie*, XII, Dec., 1919.

In Notes and News, p. 346, appears the notice of the death of the late J. M. Macoun, whose obituary appeared in a previous number of this journal.

Pp. 348-352 contain an interesting survey of the location and distribution of complete sets of the *Auk*. As this journal is the most important bird publication in the New World but little work in the field can be accomplished without reference to its files. It is therefore somewhat alarming to note that, so far, only about 150 complete sets have been located in public or private libraries. As those in private hands are steadily being absorbed by institutions where they remain, and there is a constant loss through fire and accident, the question is naturally raised as to what the future student, not situated near any of a certain limited number of institutions, will do for this important literature. It is worth noting both for information and as a warning that but eight complete sets exist in Canada. Two are to be found in each of the following cities, Montreal, Ottawa and Toronto, and one each in London and Quebec. It will be noted that there is not a single complete file west of southern Ontario. Unless this is corrected whilst the opportunity for correction exists it will place future ornithologists in western Canada at a great disadvantage.

P. A. TAVERNER.

INDEX TO VOLUME XXXIV.

PAGE

Acanthis linaria 24, 51, 154
Accessions to Geological Survey Museum 117
Accipiter velox 22, 49, 91, 123, 162
" *cooperi* 22, 49, 123, 154, 162
Acipenser rubicundus 125
Actitis macularia 22, 49, 91, 123, 162
Aegialitis semipalmata 22, 49, 91 123, 162
Agaric, Deadly 75
Agaric, Fly 74
Agaricus campestris 13
Agelaius phoeniceus 23, 51, 163
Aglais j-album 8
" *antiopa* 126
Aix sponsa 48, 91, 162
Alberta Nat. His. Soc. 18
Alca torda 80
Alces americanus 68, 125, 168
Amanita muscaria 74
" *phalloides* 75
" *verna* 76
Ambystoma jeffersonianum 144
Ameiurus nebulosus 143
Ammodramus savannarum 51
Ampelis cedrorum 25
Anas obscura 22
" *platyrhynchos* 47
" *rubripes* 47, 123, 161
" *r. tristis* 91
Anderson, R.M., articles by 19, 58, 115
Angel, the Destroying 76
Archilochus colubris 50, 92, 163
Anthus pennsylvanicus 25
" *rubescens* 53
Aquila chrysaetos 154
Archibuteo lagopus 49
" *l. sancti-johannis* 92
" status of genus 20
Archilohcus colubris 50, 92, 163
Arctonetta fischeri 43
Ardea herodias 22, 48, 91, 123, 162
Arenaria morinella 22, 91
Argulidae from Nova Scotia 149
Argulus alosae 149
" *piperatus* 149
Asio wilsonianus 49

PAGE

Asio flammeus 50
Astragalinus tristis 24, 51, 93, 124, 164
Astur atricapillus 49
Athyrium angustifolium 138
Auk, Razor-billed 80
Aythya marila 22, 154
Azure, Spring 9

Baldpate 22
Bartramia longicauda 22, 48
Basilarchia arthemis 8
" *archippus* 8
Bass, Small-mouthed black 143
Batrachians of Otter lake region, Ont. 143
Beckmannia crucaeformis 28
Bear Black 63, 125, 166
Bats 166
Beaver, Canadian 68, 125, 168
Billings, W. R., obituary, notice of 57
Bird Banding 158
Bird, Christmas census 98
Bird, Rusty black 23, 97, 119
Birds, changes in status in vicinity of Quebec 132
Birds of Coldstream, Ont. 47
Birds, how to attract them about homes 81
Birds, Lake Shore Migration, Beamsville, Ont. 21
Bird Migration 119
Birds of Shoal Lake, Man. 154
Birds, of Eastern Canada, notice of 160
Birds of Otter Lake region, Ont. 161
Birds in relation to Insect control 151
Birds, Summer of Gaspe, Que. 78, 87
Birds of Red Deer river, Alta. 19
Birds of wilderness of Nova Scotia 36, 117
Bittern, American 48, 91, 162
" Least 48
Black birds 23, 51, 97, 119, 163
Blarina brevicauda 63, 166
Bluebird 26, 53, 166
Bobwhite 49
Bobolink 23, 51

PAGE

Bombycilla cedrorum 52, 93, 125, 164
" *garrula* 134
Bonasa umbellus 49, 123
u. togata 22, 91, 162
Book Notices 19, 37, 58, 115, 160, 176
Botaurus lentiginosus 48, 91, 162
Botrychium Lunaria 139
" *obliquum* 139
" *ramosum* 139
" *ternatum* 139
" *virginianum* 139
Branta canadensis 22, 48, 123
Bubo virginianus 50, 124, 162
Bufflehead 22, 48
Bufo americanus 144
" *lentiginosus* 125
Bunting, Indigo 51, 164
" Snow 51
Buteo borealis 23, 49, 91, 123, 162
" *swainsonii* 23
" *lineatus* 49, 162
" *platupterus* 49, 92, 162
Butorides virescens 22, 48
Butterfly, Cabbage 8
" Hunter's 8
" Mourning cloak 126
Butterfly, a doped 119

Calcarius lapponicus 24
Calidris arenaria 22
" *leucophaea* 91
Calopogon pulchellus 45
Calvert E. W., article by 109
Camptorhynchus labradorius 155
Canis occidentalis 63, 125
" *lycaon* 166
Canthartes aura 154
Cardinal 51, 97
Cardinalis cardinalis 51
Caribou, Woodland 69
Carpodacus purpureus 24, 51, 93, 164
Carterocephalus palaemon 9
Cassels, Elsie, articles by 99, 159
Castor canadensis 68, 125, 168
Catbird 25, 53
Catostomus richardsoni 19
" *commersonii* 143
Cathartes aura 49, 154

INDEX—*Continued.*

PAGE

Catfish 143
Cayuga minnow 143
Centurus carolinus 50
Ceophlacus pileatus abieticola 154
Cepphus grylle 80
Certhia f. americana 95, 165
" *familiaris* 53
Cercyonis alope nephele 8
Ceryle alcyon 23, 50, 92, 124, 162
Chaetura pelagica 23, 50, 92, 163
Charadrius dominicus 49
Charitonetta albeola 22, 48
Chat, Yellow-breasted 52
Checker-Spot, Harris' 8
Chelydra serpentina 145
Chickadees 25, 53, 95, 97, 99, 125, 166
Chrosomus erythrogaster 143
Chipmunks 66, 67, 125, 168
Chordeiles virginianus 23, 50, 92, 124, 163
Chrysemys marginata 145
Circus hudsonius 22, 49, 91, 123, 162
Cistothorus stellaris 53
Clangula clangula 48, 123
" *islandica* 48
" *c. americana* 22, 91
Clitocybe illudens 77
Coccyzus americanus 50
" *erythropthalmus* 23, 50, 162
Coffin-carriers, among the 101
Colaptes auratus luteus 23, 92, 163
" *auratus* 50, 124
Colinus virginianus 49
Colymbus auritus 21, 47, 161
" *holboellii* 47
Comma, Green 8
Compsothlypis americana 52
" *a. usneae* 95, 164
Condylura cristata 166
Contopus virens 23
Coot 48
Cope's Minnow 143
Corallorrhiza maculata 46
Coregonus prebleí 19
" *clupeiformis* 143
Cormorant, Double-crested 21, 88

PAGE

Corvus americanus 23
" *brachyrnchos* 50, 92, 124, 163
" *corax principalis* 92, 163
" *corax* 124
Cowbird 23, 51, 92
Crane 123
Creeper, Brown 53, 95, 165
Criddle, Norman, articles of 14, 151, 174
Cristivomer namaycush 143
Crossbills 51, 93, 97, 164
Crow 23, 50, 92, 124, 163
Crustacea, Larger Freshwater, of Canada and Alaska 126, 145
Crytoglaux acadia 50, 154, 162
" *tengmalmi* 154
Cuckoos, Black-billed 23, 50
Curlew, Eskimo 133
" Hudsonian 22, 91
Cyanocitta cristata 23, 50, 92, 163
Cystopteris bulbifera 139

Dace, Red-bellied 143
" Horned 143
Dafila acuta 22
Dale, E. M. S., article by 97
Deer, Northern Virginia 68, 168
Dendroica aestiva 25, 52, 95, 165
" *caerulescens* 25, 52, 95, 165
" *castanea* 52, 95, 135, 165
" *cerulea* 52
" *coronata* 25, 52, 95, 125, 135, 165
" *discolor* 52
" *fusca* 52, 95, 136, 165
" *maculosa* 25
" *magnolia* 52, 95, 165
" *palmarum* 52, 95
" *pennsylvanica* 52
" *striata* 25, 52, 95, 135
" *trigrina* 25, 52, 95, 135
" *virens* 25, 52, 95, 165
Diadophis punctatus 145
Dolichonyx oryzivorus 23, 51
Dove, Mourning 22, 49
Drapetisca socialis 100
Dryobates pubescens medianus 23, 50, 92, 163

PAGE

" *villosus* 23, 50, 163
Ducks, 22, 47, 48, 91, 97, 123, 154, 155, 161, 162
Dumetella carolinensis 53
Dyer, G. M., note by 60

Eagles 49, 92, 123, 154, 162
Eiders, 43, 44, 48
Emerton, J. H., article by 106
Empidonax flaviventris 23, 50, 92, 163
" *minimus* 23, 50, 163
" *trailli* 50
" *trailli alnorum* 92, 163
Enodia portlandia 8
Entomological, a unique experience 120
Epimys novegicus 168
Epipactis tesselata 46
Erethizon dorsatum 66, 168
Ereunetes pusillus 48, 91, 123, 162
Erignathus barbatus 125
Erismatura jamaicensis 48
Esox lucius 143
Euphagus carolinus 51, 164
Eupomotis gibbosus 143
Euphyes vestris 9
Euotomys gapperi 66
Eutamias quadrivittatus borealis 125
Eutamias quadrivittatus neglectus 66
Eurymus philodice 8
Evotomys gapperi 167
Fable of to-day 13

Falco sparverius 23, 49, 92, 123, 162
" *peregrinus anatum* 92
" *columbarius* 92
Fall Migrants 1
Farley, F. L., article by 119
Fat-head 143
Fauna and Flora of East and Middle Sister and North Harbor Islands, Lake Erie 109
Fauna of Moose river 121
Ferns of Hatley, Que. 137
Finch, Purple 24, 51, 93, 164
Feniseca tarquinius 9
Fish of Otter Lake region 142
Fisher 64, 167

INDEX—*Continued.*

PAGE

Fishes, six new, from Northwestern Canada ____ 19
Flickers__ 23, 50, 92, 124, 163
Flora of Warren's Landing, Man.____ 26
Flycatchers 23, 50, 92, 134, 163
Fox, Common Red____63, 166
Fratercula arctica ____ 80
Frogs____125, 144
Fulica americana ____ 48

*Galeoscoptes carolinensis*_ 25
Gallinago delicata 48, 123, 162
Gallinule, Florida____ 91
Gannets ____ 20, 87
Gavia immer 21, 47, 80, 121, 161
" *lumme* ____ 154
Geothlypis trichas brachidactyla ____ 25
Geothlypis trichas 52, 95, 125, 165
Gervillia stantoni ____ 55
Gibson, A., article by 38, 176
Gnatcatcher, Blue-gray 53, 136
Golden-eyes___ 22, 48, 91, 123
Gold finches 24, 51, 93, 124, 164
Goose, Canada____ 22, 48, 123
Grackles____23, 51, 92, 164
Grebes____21, 47, 161
Grey-veined white ____ 9
Groh, Herbert, article by 18
Grosbeaks 51, 93, 97, 134, 154
Grouse 20, 22, 49, 91, 123, 162
Grus canadensis ____ 123
Guillemot, Black ____ 80
Gulls__21, 47, 80, 87, 121, 161
Gussow, H. T., article by 119

Habenaria (x) *andrewsii* 45
" *fimbriata* ____ 45
" *Hookeri*____172
" *macrophylla* __ 45
" *orbiculata* ____ 45
Haliaeetus leucocephalus 49, 123, 162
" " *alascanus* 92
Hairstreaks ____ 9
Hares____68, 125, 168
*Harelda hyemalis*__ 22, 48, 91
Hawks____ 22, 23, 49, 91 92, 116, 123, 124, 154, 162
*Helodromas solitarius*__48, 162
*Helminthopila peregrina*__ 25
Herons____22, 48, 91, 123, 162
*Hesperiphona vespertina*__ 134
Hewitt, C. G., obituary notice of____ 174
*Histrionicus histrionicus*__ 91
Hirundo erythrogaster 24, 51, 93, 164
House Rat ____ 168
Humming birds 23, 50, 92, 163
Hydrochelidon nigra surinamensis ____ 47, 87
Hylocichla aliciae ____ 26, 53, 95, 136
" *fuscescens* 53, 95, 166
" *mustelina*____53, 166
" *ustulata*____53, 95, 166
" *guttata* 53, 95, 125, 166
" *guttata pallasii*__ 26, 95
" " ____ 53, 125
" *ustulata swainsoni* 26, 95
" " ____ 53
*Hyla crucifer*____ 144
" *v. versicolor* ____ 144

*Icterus galbula*____23, 51, 164
" *spurius* ____ 51
" *virens* ____ 52
Iridoprocne bicolor ____ 25, 51, 93, 124, 164
Isopoda from Canada and Alaska ____ 145
Ixobrychus exilis ____ 48

Jack-O-Lantern ____ 77
Jaeger at Sylvan Lake Alta. 159
Jays____23, 50, 92, 124, 163
Johansen, F. articles by 126, 145
Junco hyemalis ____ 24, 51, 93, 124, 134, 164

Killdeer____22, 49, 162
Kindle, E. M., articles by 56, 57
Kingbird____23, 50, 92, 163
Kingfisher, Belted ____ 23, 50, 92, 124
Kinglets____25, 53, 72, 95, 166
Kittiwake ____ 80
Klugh, A. B., articles by 100, 119, 120

Lady, Painted ____ 8
Laing, Hamilton M., article by ____ 21
Latchford, F. M., articles by____30, 69
Lambe, L. M., obituary notice of____ 56
*Lanius borealis*____25, 52, 93
" *ludovicianus migrans* 25, 135
" " 52
*Lanivireo flavifrons*____52, 165
" *solitarius* 52, 93, 135, 165
Lapland Longspur ____ 24
Larks ____ 14, 23, 50
Larus argentatus 21, 47, 80, 121, 161
" *delewarensis* ____ 21
" *marinus* ____ 80
" *philadelphia*__ 21, 47, 87
Lead poisoning in waterfowl ____ 57
Lepus americanus 68, 125, 168
Leuciscus neogaeus ____ 143
Leucichthys athabascae __ 19
" *entomophagus* 19
" *macronathus*__ 19
Lewis, H. F., articles by 101, 117, 132
Ling ____ 143
*Liopeltis vernalis*____ 145
Liparis Loeselii ____ 46
*Listera cordata*____ 46
Lloyd, H., articles by. __ 98, 116, 155
Lobipes lobatus ____ 91
Loons 21, 47, 80, 121 154, 161
Lota maculosa ____ 143
Lophodytes cucullatus 47, 161
Lowe, C. W., article by 26
*Loxia curvirostra*__51, 93, 164
" *leucoptera*__51, 93, 164
Lucius lucius ____ 125
Lutra canadensis ____ 64
Lycaenopsis pseudargiolus marginata ____ 9
Lynx, Canada ____64, 167
*Lynx canadensis*____ 167
" *ruffus*____ 167

Macoun, James M., obituary notice of____ 38
Macoun, John, obituary notice of____ 110
Macoun, John, Memorial 176
Macoun, W. T., article by 110
Macrolepidoptera of Alta. 37

INDEX—*Continued.*

PAGE

Mallard ____ 47
Malte, M. O., article by 38
Mammal, new for Canada 17
Mammals of Ridout district, Ont. ____ 61
Mammals of Otter Lake, Ont. ____ 166
Mareca americana ____ 22
Marmota monax canadensis 66, 168
Marila affinis ____ 48
" *americana* ____ 48
" *marila* ____ 48
Martes americana ____ 63, 167
" *pennanti* ____ 64, 167
Martin ____ 63
Martin, Purple 25, 51, 134, 164
McLearn, F. H., article by 53
Meadowlark 24, 51, 92, 134, 163
Megascops asio ____ 23
Melanerpes erythrocephalus 23, 50, 163
Melitaea harrisi ____ 8
Melospiza georgiana ____ 51, 124, 134
" *lincolni* ____ 51, 93, 134
" *melodia* ____ 24, 51, 93
Mephiti mephitis ____ 64, 167
Mergansers ____ 161
Mergus americanus ____ 161
Merula migratoria ____ 26
Mice, Jumping ____ 65, 66
Microtus fontigenus ____ 66
" *pennsylvanicus* ____ 167
Micropterus dolomieu ____ 143
Microstylis monophyllos ____ 46
" *unifolia* ____ 46
Middleton, J. C., article by 81
Migratory Birds Convention Act, prosecutions ____ 36, 117, 157
Mink ____ 64
Mniotilta varia 25, 52, 95, 135, 165
Moles ____ 166
Molothrus ater ____ 23, 51, 92
Mousley, H., articles by 7, 44, 96, 137, 169, 173
Moose ____ 68, 125, 168
Morchella bispora ____ 11, 119
" *esculenta* ____ 11
Morris, Frank, article by 34

PAGE

Motion pictures teaching bird protection ____ 98
Murre ____ 80
Mus musculus ____ 168
Musculium transversum ____ 70
" *truncatum* ____ 71
Muskrat ____ 66, 168
Mustela cigognanii ____ 64, 167
" *vison* ____ 64, 167
" *noveboracensis* ____ 167
Mushrooms, Poisonous ____ 74
Myiarchus crinitus 23, 50, 134, 163
Myiochanes virens ____ 50, 163
Myotis subulatus ____ 166
" *lucifugus* ____ 166

Nannus hiemalis ____ 52, 95, 165
Natrix s. sipedon ____ 145
Nesorax albibarbis ____ 62
Nelson, E. W., article by 158
Nettion carolinense ____ 47
Nightawk ____ 50, 92, 124, 163
Newt, Common ____ 144
Notropis cayuga ____ 143
" *cornutus* ____ 143
Norman, E. S., article by 154
Notes and observations ____ 17, 36, 60, 116, 157
Notophthalmus viridescens 144
Norwegian Arctic Expedition, report ____ 115
Numenius borealis ____ 133
" *hudsonicus* ____ 22, 91
Nuthatches 25, 53, 95, 154, 165
Nuttallornis borealis 50, 134, 163
Nyctea nyctea ____ 50
Nycticorax nycticorax naevius ____ 22, 91, 162

Obituary notices 38, 56, 57, 109, 174
Oceanodroma leucorhoa ____ 87
Odell, W. S., article by ____ 10
Odocoileus americanus borealis ____ 68, 168
Oidemia americana 42, 91, 155
" *deglandi* 22, 42, 48, 91
" *perspicillata* ____ 42, 91
Old Squaw ____ 22, 48, 91
Olbiorchilus hiemalis ____ 25
Ondatra zibethica ____ 66, 168
Ophioglossum vulgatum ____ 139

PAGE

Oporornis agilis ____ 52
" *philadelphia* 52, 95, 136, 165
Opsopoeodus borealis ____ 19
Orchids ____ 44, 45, 46, 169
Orchis rotundifolia ____ 172
Orioles ____ 23, 51, 164
Osmunda regalis ____ 139
" *cinnamomea* ____ 139
Ospreys ____ 22, 49, 92, 123, 162
Otter ____ 167
Otis asio ____ 50
Otocoris alpestris praticola 23, 50
Ottawa Field-Nat. Club Report ____ 16
Ottawa Field Nat. outings 38
Otter, Canada ____ 64
Ovenbird ____ 52, 95, 165
Owls, 23, 49, 50, 124, 154, 162
Oxyechus vociferus 22, 49, 162
Pandion haliaetus carolinensis ____ 22, 92, 123, 162
Pandion haliaetus ____ 49
Papilio polyxenes ____ 7
Parus atricapillus ____ 25
Passer domesticus ____ 24, 124, 164
Passerculus sandwichensis savanna 24, 51, 93, 124, 164
Passerella iliaca ____ 24, 51, 93
Passerina cyanea ____ 51, 164
" *nivalis* ____ 24
Pearly Eye ____ 8
Pedioecetes phasianellus ____ 162
Peeper, Spring ____ 144
Pelecypods, new, from Coloradoan of the Peace and Smoky Valleys, Alberta ____ 53
Pelidna alpina ____ 48
Penthestes atricapillus ____ 53, 95, 125, 166
" *hudsonica littoralis* 95, 166
Perea flavescens ____ 143
Perch ____ 143
Perisoreus canadensis 92, 124, 163
Peromyscus maniculatus 65, 167
Petrochelidon lunifrons ____ 24, 51, 93, 164
Petrel, Leach's ____ 87
Pewee, Wood ____ 23, 50
Phalacrocorax dilophus ____ 21

INDEX—*Continued.*

PAGE

*Phalacrocorax auritus*__ 88
Phalaropes _____ 91
*Phenacomys intermedius*__ 17
Philohela minor _____ 48, 91
Phoebe_____23, 50, 163
*Phloeotomus pileatus*____ 50, 124, 163
Phyciodes nycteis _____ 8
Picoides arcticus 50, 124, 154, 163
Pieris rapae _____ 8
Pickerel _____ 125
Pike _____ 125, 143
Pimephales promelas ____ 143
Pinicola enucleator leucura _____ 93, 154
Pinicola enucleator ____ 51
Pintail _____ 22
Pipit _____ 25, 53
Pipilo erythrophthalmus 24, 51, 164
Pipistrellus subflavus ____ 17
*Piranga erythromelas*__51, 164
Pisobia maculata _____ 48
" *minutilla* _____ 48, 91
*Planesticus migratorius*___ 52, 95, 125, 166
Plectrophenax nivalis ____ 51
Plethodon cinereus _____ 144
Plovers 22, 48, 49, 91, 123, 162
*Podilymbus podiceps*__47, 161
*Pogonia ophioglossoides*__ 173
*Polioptila caerulea*____ 53, 136
Polites mystic _____ 9
Polygonia interrogationis 8
" *faunus* _____ 8
Polysticta stelleri _____ 44
Polystichum acrostichoides 138
" *Braunii* ____ 138
Polypody, Common ____ 138
Polypodium vulgare ____ 138
Porcupine, Canada____66, 168
*Porzana carolina*_____ 48
Pooecetes gramineus 24, 51, 134, 164
*Procyon lotor*_____ 166
*Progne subis*__25, 51, 134, 164
Pteretis nodulosa _____ 139
Puffin _____ 80
Puppy, avoiding starvation 100
Purple Banded, the _____ 8
Puss in Sparrow chase __ 18

Quebec Soc. Prot. Birds 60
Querquedula discors ____ 47
Quiscalus quiscalus aeneus 23, 92, 164
" *quiscalus*_____ 51
Raccoon_____ 167
Rail _____ 48
Rana catesbeiana _____ 144
" *clamitans* _____ 144
" *palustris* _____ 144
" *pipiens* _____ 144
" *septentrionalis*__ 125, 144
" *sylvatica* _____ 144
Rallus virginianus _____ 48
Rangifer caribou _____ 59
Ravens_____92, 124, 163
Redpolls_____ 24, 51, 97, 154
Redstarts 25, 52, 95, 125, 165
Regulus calendula 25, 53, 95, 166
" *satrapa* 25, 53, 95, 166
Reptiles of Otter lake region, Ont._____ 143
Rhopalocera of Hatley, Que._____7, 173
Riparia riparia 25, 51, 93, 125, 164
Rissa tridactyla _____ 80
Robins____26, 53, 95, 125, 166
Russula emetica _____ 76

Sable, American _____ 63
Salamanders _____ 144
Salvelinus fontinalis ____ 143
Sanderling _____ 22
Sandpipers _____ 22, 48, 49, 91, 96, 123, 162
Sapsucker, Yellow-bellied 23, 50, 92, 97, 124
Saunders, W. E., articles by _____ 17, 19, 156, 160
*Sayornis phoebe*____23, 50, 163
Scarlet Cap_____ 76
*Sciuropterus sabrinus*_____168
Sciurus hudsonicus 68, 125, 168
" *carolinensis*____59, 168
" *aurocapillus* 52, 95, 165
" *noveboracensis* 52, 95, 165
*Scolecophagus carolineus*_ 23
Scoters_____ 22, 41, 42, 48, 91
Scotiaptex nebulosa ____ 154
Seal, Bearded _____ 125
*Semotilus atromaculatus*__ 143
Setophaga ruticilla _____ 25, 52, 95, 125, 165
Shiner _____ 143
Shoveller_____ 22, 47, 91
Shrews_____62, 63, 125, 166
Shrikes_____ 25, 52, 93, 135
*Sialia sialis*_____26, 53, 166
Simpson, S. E. R., article by_____141, 161
Siskins____51, 93, 97, 134, 164
Sitta canadensis 25, 53, 95, 165
" *carolinensis*__ 25, 53, 154
Skippers _____ 9
Skunk, Canada _____ 64
Smith, H. A. P., article by _____ 36
Snakes _____ 125, 145
Snipe, Wilson's____48, 123, 162
Snowflake _____ 24
Somateria spectabilis __ 43, 48
" *mollissima* __ 43
" *v. nigra* ____ 43
Soper, J. D., articles by 61, 72
Sorex fumeus _____ 62
" *personatus* _____ 62
" *richardsoni* _____ 62
Sparrows 17, 24, 51, 93, 97, 117, 124, 134, 164
*Spatula clypeata*____ 22, 47, 91
Sphaeridae, Canadian__ 30, 69
Sphaerium crassum _____ 30
" *acuminatum* __ 33
" *flavum* _____ 31
" *occidentale* ___ 31
" *emarginatum* __ 33
" *striatinum* ____ 34
" *modestum* ____ 69
" *patella* _____ 70
" *rhomboideum*__ 32
" *solidutum* ____ 70
" *stamineum* ____ 33
" *spokani* _____ 69
" *tenue* _____ 70
" *torsum* _____ 33
" *tumidum* _____ 69
" *vermontanum* _ 70
Sphyrapicus varius _____ 23, 50, 92, 124, 163
Spider, a new to Canada 100
Spiders of Canada _____ 106
*Spinus pinus*__51, 93, 134, 164
Spiranthes gracilis _____ 45
*Spizella monticola*_____ 24, 51
" *passerina*___51, 93, 164

INDEX—*Continued.*

PAGE

Spizella pusilla ____ 51
Squirrels____59, 68, 125, 168
Spleenwort, Narrow-leaved 138
Squatarola squatarola 22, 49, 91
Starling in Canada____ 99
Stelgidopteryx serripennis 52
Sterna caspia ____ 21
" *hirundo* 21, 47, 87, 121
Stizostedion vitreum ____ 125
Storeria occipito-maculata 145
*Sorex personatus*____ 166
Stone, R. E., article by__ 74
*Strix Varia*____ 162
*Strymon acadica*____ 9
" *liparops* ____ 9
Sturgeon, Lake ____ 125
Sturnella magna 24, 51, 92, 134, 163
Swallow-tail, Black____ 7
Swallows____ 24, 25, 51, 52, 93, 124, 125, 156, 164
Swift, Chimney____ 23, 50, 92
Sucker____ 125, 143
Sula bassana ____ 87
Sulphur, Clouded____ 8
*Surnia ulula caparoch*____ 154
" " ____ 124
Synaptomys factuus ____ 65

*Tamias striatus lysteri*__67, 168
Tanager, Scarlet____51, 164
Taverner, P. A., articles by 20, 37, 41, 59, 99, 100, 117 118, 158, 176.
Teal____ 47
*Tellina dunvegaensis*____ 55
" *peaceriverensis*____ 55
Terns____ 21, 47, 87, 121
Terrill, L. McI., article by 1
*Thamnophis sirtalis*__ 125, 145
Thelypteris hexagonoptera 138
" *marginalis*____ 138
" *Goldiana*____ 138
" *Boottii*____ 138

PAGE

*Thelypteris cristata*____ 138
" *spinulosa*____ 138
Thrasher, Brown____ 25, 53
Thrushes 26, 52, 53, 95, 125, 126, 166
*Thryothorus ludovicianus*_ 53
Toads____ 125, 144
Tortoise, Compton ____ 8
*Totanus melanoleucus*____ 22, 48, 91, 123
" *flavipes*____43, 162
Towhee ____ 24, 51
Townsend C. W., article by 78, 87
*Toxostoma rufum*____ 25, 53
Tragopogon pratensis ____ 116
Tringa canutus ____ 48
Trochilus colubris ____ 23
Troglodytes aedon 25, 53, 136, 165
Trout, Brook ____ 143
Turkey Vulture____ 49, 154
Turnstone, Ruddy____ 22, 91
Turtles, ____ 145
Tyrannus tyrannus 23, 50, 92, 163

Uria troille ____ 80
*Ursus americanus*__63, 125, 166

Vanessa cardui ____ 8
" *virginiensis*____ 8
Veery ____ 53, 95
Vermivora peregrina 52, 95, 135
" *celata*____ 52
" *chrysoptera*____ 52
" *rubricapilla* 52, 135, 165
Viceroy, ____ 8
Violet Tip ____ 8
Vireo flavifrons ____ 25
" *olivaceus* ____ 25
Vireosylva olivacae 52, 93, 125, 164

PAGE

Vireosylva philadelphica 52, 93, 135, 165
" *gilva*____52, 165
Vertebrates of Otter Lake region, Ont. ____ 141, 161
*Vulpes fulva*____63, 166

Wanderer ____ 9
Warblers, 25, 52, 95, 125, 135, 136, 156, 165
Water-thrush____ 165
Waxwings, 25, 52, 93, 125, 134
Weasel, Short-tailed ____ 64
Whip-poor-will____ 50, 163
Whitefish ____ 143
Whittaker, E. J. article by 100
Williams, M. Y. article by 121
Wilson, C. B., article by 149
Wilsonia canadensis 25, 52, 136, 165
" *pusilla*____ 25, 52, 95
Winter bird list from London ____ 97
Wolf, Gray____63, 125, 166
Wood, A. A., article by 47
Woodchuck, Canada__66, 168
Woodcock ____ 48, 91
Wood-nymph, Clouded___ 8
Woodpeckers ____ 23, 50, 92, 124, 154, 163
Woodsia glabella ____ 139
Wrens____25, 53, 95, 136, 165
Wright, A. H., articles by____141, 161, 166

Yellow-legs 22, 48, 91, 123, 162
Yellow-throats 25, 52, 95, 125, 165

Zamelodia ludoviciana, 51, 164
*Zapus hudsonius*____ 168
*Zenaidura macroura*____ 22, 49
Zonatrichia albicollis ____ 24, 51, 93, 124, 164
" *leucophrys*____ 51, 93

CANADIAN FIELD-NATURALIST

INDEX TO VOLUME XXXV

ISSUED JULY, 1922

Page

Abies grandis 84
Acanthis linaria.. 53
Acanthosicyos horrida... 75
Acanthocephala.. 40
Accipiter atricapillus.... 96
Accipiter cooperi.. 96
Accipenser rubicundus.. 98
Actinosphaerium eichhornii 101
Actitis macularia.... 96, 127
Aegialitis meloda.. 127
Aegialitis semipalmata.. 96
Aequorea forscalea.. .. 50
Africa, German South-West 74
Agelaius phoeniceus.. 97, 127
Alces americanus..... 98
Algae of Okanagan..... 112
Alona guttata..... 73
Ampelis cedrorum..... 97
Amorostoma marginata.. 130
Anabaena flosaquae..... 112
Anabaena inaequalis.... 112
Anacardiaceae 124
Anas boschas..... 95
Anas obscura..... 95
Anas platyrhynchos... 51, 127
Ankistrodesmus setigurus 113
Anthus pennsylvanicus.. 97
Anthus rubescens..... 53
Aphrocallistes whiteavesianus 49
Appointments 60
Apus longicaudatus..... 47
Arachnida 131
Artemia salina..... 27
Artemiopsis bungei..... 29
Artemiopsis stefanssonii 29
Ascidians 49
Ascidiopsis paratropa... 49
Asellus communis..... 89
Asio accipitrinus..... 96
Association among Marine Animals..... 48
Astragalinus tristis.... 53, 97
Astur atricapillus..... 52
Avian Fauna of Islay.... 50

Bacillarieae 112
Badgers 105, 107
Bathydorus dawsoni..... 49
Bears 97
Beavers 108
Betula alba..... 104
Bicidium aequoreae..... 50
Biota of a Sand Spit... 121
Bird Banding..... 78
Bird Census from London 119
Bird Migration..... 54
Bird Notes in Maritime Provinces 11
Bird Sanctuaries..... 35
Birds of Prince Edward Island 58
Birds, Check List of.... 36
Birds as Foster Parents 142
Birds of Manitoba..... 133

Page

Bittern, American..... 51
Blackbirds.... 53, 97, 120, 127
Blenny 48
Bluebirds 54, 135
Bombycilla cedrorum.... 127
Bombycilla garrula..... 100
Bonasa umbellus..... 52, 96
Bone Beds, Formationof 33
Bosmina longirostris..... 73
Bosmina longispina..... 73
Botaurus lentiginosus.... 51
Botrydium granulatum.. 114
Botryococcus braunii.... 114
Branchinecta coloradensis 27
Branchinecta gainii..... 25
Branchinecta paludosa.... 25
Branchipus stagnalis.. 25, 27
Brant, Black..... 51
Branta canadensis.... 51, 95
Branta nigrescans..... 51
Brittle-Stars 48
Brown, W. V., article by 80
Bubo virginianus..... 52, 96
Buccinum undatum..... 3
Bufo hemiophrys..... 128
Bufo lentiginosus..... 98
Buntings, Snow..... 11, 53
Buteo borealis..... 96
Buteo platypterus..... 96
Buteo swainsoni..... 52
Buzzard, Turkey..... 52

Calcarius pictus..... 53
Calianessa californiensis.. 50
Caluatia craniformis.... 104
Caluatia gigantica..... 104
Cancer borealis..... 3
Cancer irroratus..... 3
Cancer productus..... 49
Canis latrans..... 108
Canis occidentalis.... 97, 126
Cardinal 120
Caryophyllaceae 124
Castor canadensis..... 108
Cathartes aura..... 52
Caularchus meandrinus.. 50
Ceriodaphnia megalops.. 73
Ceryle alcyon..... 96, 127
Chaetophora elegans.... 113
Chaetophora pisiformis.. 113
Chasmosaurus belli..... 64
Chen hyperboreus..... 35
Chenopodiaceae 124
Chickadees 12, 54, 59, 97, 100, 120, 128
Chipmunks..... 18, 98, 107
Chlamydomonadeae 112
Chordeiles virginianus 96, 127
Chydorus sphaericus.. 72, 73
Ciona intestinalis..... 49
Circus hudsonicus.. 52, 96, 126
Citellus franklinii.... 106, 125
Citellus richardsonii..... 105
Citellus tridecemlineatus. 107
Cladophora crispata..... 113
Clams 48
Clam Shrimps 88

Page

Clangula clangula..... 95
Cling-Fish 48
Cod, Rock 48
Colaptes auratus..... 53, 96
Coleoptera 130
Columba livia..... 98
Colymbus auritus..... 51
Commensalism in Marine Animals 49
Compositae 124
Conesius plumbeus..... 66
Conifers, Overgrowth of Stumps of..... 81
Cormorant 127
Cornaceae 124
Corvus brachyrhynchos 53, 127
Corvus corax..... 97
Corylus rostrata..... 19
Cox, P., article by..... 66
Coyote 108
Cranes 51, 52
Creeper, Brown..... 120
Criddle, N., article by.. 123
Crossbills.. 53, 57, 97, 120, 140
Crows.... 11, 53, 58, 120, 127
Crustacea, Freshwater 21, 45, 88, 99
Cryptacanthodes maculatus 4
Cyanea artica..... 50
Cyanea capillata..... 2
Cyanocitta cristata..... 53
Cyclocypris laevis..... 73
Cyclops americanus..... 73
Cyclops biscupidatus.... 73
Cyclops fimbriatus..... 73
Cyclops parens..... 73
Cyclops quadricornis.... 72
Cyclops viridis..... 73
Cyperaceae 124
Cypridopsis vidua..... 73
Cyprinid, new..... 66
Cypris dentata..... 73
Cypris testudinaria..... 73
Cyzicus mexicanus..... 91

Dactylococcopsis montana 112
Dale, E. M. S., articles by 100, 119
Daphnia longispina.... 72, 73
Daphnia pulex..... 72, 73
Deer..... 98, 111
Dendroica aestiva..... 128
Dendroica castanea..... 128
Dendroica coronata..... 53
Dendroica discolor..... 59
Dendroica fusca..... 128
Dendroica magnolia..... 128
Dendroica vigorsi..... 100
Desmidiaceae 114
DeVany, J. L., article by 16
Diaptomus oregonensis.. 73
Dickcissel 135
Dinobryon cylindricum.. 114
Dinosaurs 61
Diptera 129
Distomum apodis..... 47

Page

Dragon-Flies 129
Draparnaldia glomerata. 113
Draparnaldia plumosa... 113
Dryobates villosus 96
Ducks
12, 36, 51, 95, 120, 126, 141

Ectopistes migratorius... 98
Elk 111
Empidonax virescens . . 100
Emys blandingii 17
Endocrypta huntsmani.. 49
Entomostraca, Canadian 72
Entosphenus tridentatus. 50
Equisetaceae 124
Erethizon dorsatum . . 108
Ereunetes pusillus . . . 95
Esperella adhaerens . . 49
Estheria caldwelli . . . 89, 91
Eubranchipus gelidus
23, 27, 89, 132
Eubranchipus vernalis
27, 132
Eudorina elegans 113
Euphagus carolinus... 53, 97
Eupogebia pugettensis... 50
Eutamias quadrivittatus
98, 107
Evasterias troschelii . . 49
Evotomys gapperi . . . 104

Fairy-Shrimps . . . 21, 132
Falco columbarius . . 52, 96
Falco sparverius . . . 52, 96
Farley, F. L., article by. 141
Fauna of Lower Pagwachuan River 94
Faunal Notes from the Atlantic Biological Station 1
Finches 58, 120, 140
Fir, Douglas 83
Fir, Grand 84
Flickers 13, 53, 58, 96
Florometra serratissima. 50
Flycatchers . . 13, 58, 96, 100
Foran, P., article by . . 143
Fox, Gray, in Ontario.. 19
Fraser, C. McLean, article by 48
Fucellia maritima 130

Galigus gurnardi . . . 50
Gallinago delicata.... 52, 95
Gammarus limnaeus . . 99
Gammarus locusta . . . 6
Gavia imber 95
Geese . . . 12, 35, 51, 95, 140
Gellius arcoferus . . . 1
Gibson, A., an Appreciation 16
Gilmour, A., article by . . . 60
Gnatcatcher 37
Golden-eyes 11, 95, 120
Goldfinches . . 12, 53, 97, 120
Gonium pectorale . . . 113
Grackles 11, 58, 127
Gramineae 124
Graves, Indian 103
Gravity, Deformation due to 115

Page

Grebe, Horned . . . 51, 120
Grosbeaks
41, 100, 120, 134, 141
Grouse 12, 52, 96, 120
Grus americana . . . 51, 52
Gulls
12, 35, 51, 58, 95, 120, 126, 140
Gussow, H. T., article by 116

Haloragidaceae 124
Hares 98, 107
Hawks
11, 13, 52, 80, 96, 120, 133, 135
Heart-Urchin 48
Heliozoon, new 101
Helodromas solitarius 96, 127
Hemiptera 129
Hemlock, Western . . . 86
Herons 118
Herring 48
Hesperiphona vespertina
41, 100
Holopedium gibberum . . 73
Hummingbirds 13, 58
Hydra viridis 101
Hydractinia 3, 49
Hydrophorus agalma . . 129
Hylocichla ustulata . . 54
Hymenoptera 131

Idothea metallica 3
Iridoprocne bicolor . . . 97

Jellyfish 50
Jays 13, 40, 53, 97
Johansen, F., articles by
21, 36, 45, 88, 99, 132
Juncaceae 124
Juncos
12, 53, 59, 97, 120, 140

Kindle, E. M., articles by
33, 115
Kingbirds . . . 13, 53, 58, 134
Kingfishers 13, 30, 58, 96, 120
Hymenoptera 131
Kirkconnell, W., article by 142
Klugh, A. B., articles by
18, 34, 58, 72

Labiatae 124
Lanius borealis 53
Lanivireo solitarius. . . . 53
Larix caricena 104
Larks . . . 11, 53, 58, 96, 135
Larus argentatus . . 35, 51, 95
Larus delawarensis . . . 35
Latchford, Hon. Justice, article by 68
Launce 48
Leguminosae 124
Lemnaceae 124
Lepas hillii 3
Lepidoptera 129
Lepidurus apus 47
Lepidurus arcticus . . . 47
Lepidurus couesii . . 46, 90
Lepiota naucinoides . . 104
Lepton rude 50
Lepus americanus . . 98, 107
Lepus campestris . . . 107

Page

Leuciscus carletoni . . . 67
Leuciscus rubrilateralis. 66
Lewis, H. F., article by. 35
Liard River Flood . . . 7
Limnadia lenticularis . . 91
Limnadia americana . . 91
Limnetis brachyurus . . 90
Limnetis gouldii 89
Limnetis mucronatus . . 89
Lloyd H., articles by
11, 36, 98
Longspurs 53
Loons 12, 95
Loxia leucoptera . . . 53, 97
Lynceus brachyurus . . 91
Lynxes 108, 126

Maclurea manitobaensis. 125
Macnamara, C., article by 70
Mallard 95
Mammalian Fauna of Islay 102
Marila affinis 127
Marmota monax canadensis 107
Martin, Purple 13
Melanogrammus 2
Melospiza cinerea . . . 97
Melospiza georgiana . . 128
Melospiza melodia 39, 53, 128
Mephitis hudsonica . . . 108
Merganser, American 95, 120
Merismopodia elegans... 112
Merriman, R. O. article by 59
Mesocarpeae 113
Mice 97, 111
Microspora stagnorum... 113
Microspora tumidula . . 113
Microthamnion kutzingianum 113
Microtus drummondii
97, 105, 109
Microtus minor 110
Migratory Birds Act, prosecutions.... 13, 32, 56
Mink 108
Mniotilta varia 97
Molluscs 131
Molothrus ater 127
Moose 98, 101
Mousley, H., article by.. 54
Mosses from Boskung... 142
Muskrats 98, 108
Mustela longicauda . . . 109
Mustela vison 108
Musculium columbianum. 70
Musculium declive . . . 69
Musculium jayense . . . 68
Musculium lacustre . . . 70
Musculium lenticula . . . 70
Musculium partumeium.. 68
Musculium parvum . . . 68
Musculium raymondi . . 70
Musculium rosaceum . . 69
Musculium securis . . . 68
Musculium winkleyi. . . 68
Mysis relicta 99
Myxilla parasitica . . . 49
Myxonema tenue 113

Page

Najadaceae 124
Nephrocytium aghardianum 113
Nettion carolinense . . . 127
Neuroptera 129
Nicotiana glauca 75
Nodularia harveyana . . 112
Nodularia spumigena . . 112
Nomenclature, Popular.. 38
Nostoc depressum . . . 112
Nostoc microscopicum... 112
Nuthatches . . . 97, 120, 128
Nuttalornis borealis. . . 96
Nyctea nyctea 52

Odocoileus americanus borealis 98
O'Donoghue, C. H. articles by 101, 121
Oedogoniales 114
Onagraceae 124
Ondatra zibethica . . 98, 108
Oocystis crassa 113
Oocystis solitaria 113
Oscillatoria aghardii . . . 112
Oscillatoria formosa . . 112
Oscillatoria geminata . . 112
Oscillatoria limosa . . . 112
Oscillatoria princeps . . 112
Osprey, American 96
Ottawa Field-Naturalists' Club 15
Otocoris alpestris 96
Otocoris leucolaema . . . 53
Oven bird 97
Owls 52, 96, 120, 134
Oxyechus vociferus . . 52, 127

Pagurus acadianus . . . 6
Pagurus brandti 50
Pagurus ochotensis . . . 49
Pagurus splendescens . . 49
Pandion haliaetus . . . 96
Pandorina morum. . . . 113
Parasitism among Marine Animals 50
Passerculus sandwichensis 128
Passerculus sandwichensis alaudensis 53
Passerella iliaca . . . 76, 97
Peachia parasitica . . . 2
Pedioecetes phasianellus. 52
Pelicans 127
Pelecanus erythrorhynchos 127
Pemberton, C. C., article by 81
Penthestes atricapillus 54, 128
Penthestes hudsonicus 97, 100
Perch 48
Peridinieae 112
Perisoreus canadensis . . 97
Peromyscus borealis . . 104
Peromyscus maniculatus articus 125
Peromyscus maniculatus borealis 111

Page

Peromyscus maniculatus maniculatus 97
Petrel, Hornby's 18
Phacoteae 113
Phalacrocorax auritus . . 127
Phallusia ceratodes . . . 49
Phormidium autumnale.. 112
Phyllodorus abdominalis. 50
Picea canadensis.... 102, 104
Picoides americanus. . . 96
Picoides arcticus 96
Pigeons 98
Pines 83
Pinus banksiana 105
Pinus heterophylla . . . 83
Pinus palustris 83
Pipit, American . . . 53, 97
Pisobia maculata . . . 52, 127
Pisobia bairdi 52
Planesticus migratorius 39, 54, 97
Plectrophenax nivalis . . 53
Plovers . . 13, 52, 58, 96, 148
Poecetes gramineus . . . 53
Poison Ivy 116
Polyartemiella hazeni . . 25
Polyartemiella judayi.. 24, 25
Polydora agassizii . . . 3
Polydora ciliata 3
Polydora hoplura 3
Polydora littorea 3
Polygonaceae 124
Polyphemus pediculus . . 73
Pontoporeia affinis . . . 99
Populus balsamifera 102, 104
Populus tremuloides.. 102, 105
Porcupines 70, 108
Porzana carolina 126
Prosecutions . . . 13, 32, 56
Psathyrella disseminata.. 104
Pseudacris septentrionalis 127
Pseudopleuronectes americanus 6
Pseudotsuga taxifolia . . 83

Querquedula discors . . 127
Quiscalus quiscalus aeneus 127

Rabbits 107
Racey, K., article by . . 118
Rana pipiens 129
Ranunculaceae 124
Raphidiophrys magna . . 101
Raphidiophrys viridis . . 101
Ravens 97
Redpolls 53, 120, 140
Redstarts, American.. 53, 97
Redwood 83
Relics, Indian 104
Rhadocalyptus dowlingii. 49
Rhizoclonium hieroglyphicum 113
Rivularia pisum 112
Robins 12, 39, 54, 59, 97, 120, 140
Rosaceae 124
Rowan, W., article by . . 30

Salicaceae 124
Sandpipers . . 13, 52, 95, 96
Sapsuckers 58
Scenedesmus bijugatus.. 113

Page

Scenedesmus quadricauda 113
Sciuropterus sabrinus... 107
Sciurus hudsonicus... 98, 126
Seiurus noveboracensis.. 128
Scoters 12
Scytonema myochros . . 112
Seiurus aurocapillus . . 97
Seiurus motacilla 100
Sequoia gigantea 83
Sequoia sempervirens.... 85
Setophaga ruticilla 53, 97, 128
Shrews 110
Shrikes 53, 120, 141
Sialia currucoides . . . 54
Simocephalus vetulus . . 73
Singing-Fish 48
Siskins 11, 120, 141
Sismey, E. D., articles by 112
Sitta carolinensis . . 97, 128
Skunks 108
Snakes 128
Snipe, Wilson 52, 95
Snowbirds 120
Snyder, L. L., article by. 17
Solaster stimpsoni . . . 50
Soper, J. D., articles by 50, 102
Sorex personatus haydeni 110
Sparrows 12, 39, 53, 59, 76, 97, 120
Spathiophora fascipes... 130
Spatula cyanoptera . . . 51
Sphaeriidae, Canadian . . 68
Spirogyra inflata 113
Spirogyra nitada 113
Spirogyra tenuissima . . 113
Spirulina major 112
Spirulina meneghiniana.. 112
Spizella munticola . . . 53
Spizella passerina 128
Sponges 49
Squirrels 98, 105
Starlings 100
Staurophora mertensii... 2
Sterna hirundo 95
Sternberg, C. M., article by 61
Stipitococcus urceolatus. 114
Streptocephalus coloradensis 29, 90
Sturgeon 98
Sturnella neglecta . . . 53
Suberites latus 50
Sucker 98
Swallows 12, 59, 97
Synura uvella 114

Taverner, P. A., articles by 18, 41, 76
Taxidea taxus 107
Teal 39
Teredo 3
Terns . . 13, 38, 58, 95, 126
Terrill, L. McI., articles by 57, 140
Tethyum aurantium . . 49
Tethyum igaboji 49
Tetracoccus botryoides.. 113
Tetraspora lubrica . . . 113
Thaumantias cellularia.. 50
Thompson, W. P., article

Page
by 74
Thrushes 54, 59, 100
Toads 98
Totanus flavipes 52
Totanus melanoleucus 95, 127
Trafford, O., article by . . 142
Tribonema bombycinum. 114
Trochiscia aspera 113
Tsuga heterophylla. . . 86
Tumboa mirabilis 74
Turtle, Blanding's . . . 17
Tyrannus tyrannus . . . 53

Ulothrix subtilis 113
Ulothrix zonata 113
Umbelliferae 124
Urocyon 19
Uroglena volvox 114
Ursus americanus 97

Page
Urtiaceae 124

Vancouver Natural History Society 9
Vaucheria geminata . . 113
Vespula diabolica . . 19, 34
Vireos 13, 53
Vireosylva olicacea. . . 128
Voles 97, 105, 109
Volvox aureas 113

Waders 39
Warblers
12, 37, 53, 59, 97, 100, 135
Waxwings . . 60, 97, 100, 128
Weasels 105, 109
Whittaker, E. J., article by 7
Williams, M. Y., article by 94

Page
Willets 40
Willey, A. and Huntsman, A. G., article by 1
Wintemberg, W. J., article by 19
Wolf, Grey 97
Wood, A. A., article by 100
Woodchucks 107
Woodpeckers 13, 96, 120, 140
Wrens 140

Xanthocephalus xanthocephalus 126

Yellow-Legs, Greater . . 95
Yellow-Legs, Lesser . . 52
Yellowthroats. 13, 59
Zapus hudsonicus . . 97, 111
Zoarces anguillaris . . . 6
Zonotrichia albicollis . . 97
Zygnemaceae 113

THE CANADIAN FIELD-NATURALIST

VOL. XXXV. OTTAWA, ONT., JANUARY, 1921 No. 1.

FAUNAL NOTES FROM THE ATLANTIC BIOLOGICAL STATION (1920.)

By A. Willey and A. G. Huntsman.

Owing to its geographical situation, Passamaquoddy bay occupies a critical position between the Gulf of Maine and the Bay of Fundy; its herring and pollock fisheries give it a definite standing as a fishing ground; and the Biological Station makes it a centre of research. In view of these circumstances and for other reasons which could be but need not be mentioned here, we thought it desirable to put on record some of the more salient of the occasional observations, having no relation to the main business of the station, which came to our notice during the summer of 1920. We found for example indications that when a group of animals has been treated monographically, members of that group that have not been mentioned in the monographs will nevertheless make their appearance in the bay. And their presence in the bay is at least as interesting as is their mention in a monograph.

Not all the records which follow are those of fugitive species, but great importance should be assigned to the latter because of their relation to the prevailing currents. It is sometimes assumed that permanent residents are more valuable than transitory vagrants. This is true for commercial exploitation but not for scientific interpretation. And the Biological Station may be said to exist for the purpose of effecting the reconciliation between science and commerce in fishery matters. In such a sense we believe that these notes are worth the trouble that has been involved in making the identifications.

Every bay has something out of the ordinary to offer every year, but it is rarely that the opportunity arises for the exceptional events to be authenticated.

Gellius arcoferus Vosmaer (Figure 1).

An example of this siliceous sponge, two feet in diameter, was obtained in the shrimp trawl on June 23rd, 1920, at "Prince" station No. 4, in Passamaquoddy bay, at a depth of 25 metres on a muddy bottom. From the standpoint of systematic zoology it was the most notable trophy of the season. It is a circular mat-like sponge and it is proposed to call it the "mat-sponge"; only about half of the circle was secured. It is one of Vosmaer's Arctic sponges, named by him in 1885 from material obtained by the Willem Barents Expedition (1880-1881) in the Barents Sea between 72° and 77° north latitude and between 24° and 50° east longitude, from depths of 140 to 170 fathoms. All the specimens at his disposal were fragments, flat pieces indicating, as he thought, that the original shape was probably that of a fan. Two examples of the same species were dredged up by the Swedish (Vega) Arctic expeditions, one of which was cake-like and circular, 90 mm. in diameter. These were described by Fristedt in 1887; one from Lat. 76° 52' N., Long. 116° E., 36 fathoms; the other from Lat. 59° 33' N., Long. 43° 28' W., south of Greenland, 120 fathoms.

Lastly a few examples, dredged by Mr. J. F. Whiteaves in 1872 in the Gulf of St. Lawrence off Cape Gaspé and Cap des Rosiers, 75 to 80 fathoms, were described by Lawrence M. Lambe in 1896 in the Transactions of the Royal Society of Canada for that year. These were all flat, about 18 mm. thick, and as much as 120 mm. across. Thus the sponge obtained last year at the Biological Station was much larger than any previously recorded in that species, and illustrates very well the pronounced Arctic element in the fauna of Passamaquoddy bay. Such an expanse of canal-system as this species presents must exert a profound influence upon the circulating pabulum of its environment and so play an economic rôle not less important because unperceived.

Staurophora mertensii Brandt.

This is the only large Hydromedusan of the bay. It attains a diameter of as much as 20 centimetres, and is a conspicuous object with a very distinct cross, formed by the extension of the lobes of the mouth from the centre of the animal along the four radial canals well toward the margin. In the summer of 1910 it was observed commonly in the channels leading into the bay as well as elsewhere in the vicinity. In 1912 it was observed floating in the bay and stranded on the shore at St. Andrews. Since then it has not been seen until July and August of this year (1920), when it was found very generally in the passages leading to the bay, in the bay itself, and also in the tributary waters of the Magaguadavic and St. Croix rivers and St. Andrews harbour.



Fig. 1.—Gellius arcoferus, the mat-sponge, from a photograph (A.G.H.).

Cyanea capillata, var. *arctica* Per. et Les.

This arctic form is the large red jellyfish that occurs commonly in the Gulf of St. Lawrence. *Aurelia flavidula* Per. et Les., our other Scyphozoan medusa, is a constant inhabitant of Passamaquoddy bay, appearing regularly every spring and being so abundant during the summer as to clog the plankton nets. *Cyanea*, on the other hand, is rare and comes into the bay only periodically. For several years it has been very rare or absent altogether, but during this past summer (1920) it has been fairly common. It did not make its appearance, however, before July, and it had quite evidently been brought in by currents from its home in outer waters. The sea anemone, *Peachia parasitica* Verr., that lives fastened to it, was found this year attached to large specimens just as when Cyanea was abundant a number of years ago. In that year (1913) young haddock (*Melanogrammus*) about 5 cm. long were found living commensally with the Cyanea, one or two of the fishes being taken from each large jellyfish.

Polydora ciliata (Johnston 1838).

This tubiculous annelid worm is no rarity, but its zoogeographical value is great, being almost cosmopolitan in distribution. It occurs all round the British islands; Spitsbergen; Scandinavia; coast

of France; Mediterranean and Black Sea; Atlantic coast of the United States, including the Woods Hole region; Australia and the Philippine islands. Its important synonyms are *P. agassizii* Claparede 1868, and *P. littorea* Verrill 1873.

On the shore between the Biological Station and Joe's point at low tide it is very abundant on the shells of the living whelk, *Buccinum undatum*. The free-swimming larvae are quite common in the bay, thus swelling the nutritive value of the plankton. The mud-tubes of the worms project from openings in the surface of the shell and when they are cleaned away the latter is found to be eroded with vermiform grooves. Often the worms are not buried in the shell but lie in its furrows, and they occur also elsewhere in the muddy crevices of rocks. They are not found at or near the mouth of the shell. The same species causes the so-called "worm-disease of oysters" in New South Wales (Whitelegge) and in the Mediterranean (Carrazzi), but when it infests oyster beds it attaches itself at the margin of the valves where it causes eventually a fatal accumulation of mud. Another species has been found in company with *P. ciliata*, namely, *P. hoplura*, which actually excavates galleries in the shell of oysters, but it is not certain whether this is effected by mechanical or chemical means. It is possible that *P. hoplura* may also occur at St. Andrews but it has not been recorded yet.

In frequenting the shell of such an active gastropod as the whelk, the *Polydora* derives advantage from its mobility, like *Hydractinia* which commonly selects shells occupied by Hermit Crabs but has been found upon the shell of a living *Buccinum undatum* at Woods Hole, as well as upon rocks and piles. The frequency of the occurrence of *Polydora* upon *Buccinum* at St. Andrews entitles it to the local appellation of "whelk-worm."

Lepas hillii Leach.

No *Lepadidae* are native to the bay, such as do occur being found only on drifting wood that has been brought in more or less casually from the warm waters of the Gulf Stream, where the genus *Lepas* occurs commonly in several species. There is no regularity in their entrance into the bay. In 1912 a block of wood with a large number of *Lepas hillii* attached and well perforated by the shipworm, *Teredo*, which is also an alien here, was brought to the Station by fishermen, who had found it floating beside a weir near St. Andrews. On August 17th of the present year there were sent to the Station specimens of the same species that had been taken by a fisherman from a floating lobster pot near the mouth of Kitty Cove. In both cases the fishermen considered these animals as something quite new and unheard of, which indicates their great rarity here.

Idothea metallica Bosc.

When the late Mr. N. A. Wallace was making his study of the Isopods of the Bay of Fundy (recently published) in the years 1912 and 1913, he did not find this species. Last summer (1919) during the investigation of St. Mary bay on the coast of Nova Scotia by the Biological Vessel "Prince", Dr. Philip Cox found a single specimen of this form in the bay. Subsequently we obtained a number of individuals from floating seaweed on our way across the Bay of Fundy. A large individual was taken in the St. Croix river from the wharf of the Biological Station by Dr. F. S. Jackson in July of the present year. This species is an inhabitant of the Gulf Stream, where it occurs on floating Sargasso weed. It does not properly belong to our coast, its presence indicating some drift in to the coast from the waters of the Gulf Stream.

Cancer borealis Stimpson.

The common crab of the bay is *Cancer irroratus* Say, the rock crab, which is to be found nearly everywhere on sandy and gravelly or stony bottoms from low-water mark out into deep water. At the mouth of the bay on rocky shores exposed to the waves of the Bay of Fundy the Jonah crab, *Cancer borealis*, is to be found quite regularly in small rock pools and in crevices. This latter species is about the same size as the rock crab (up to 12 or 13 cm.) but is rougher and more strongly built. In the St. Croix river in the vicinity of the Station dead individuals have been found on two occasions, namely in 1913 and again during the present summer. It was a matter, therefore, of considerable interest

to find among the crabs brought in during August from the lobster traps that were being fished in about five fathoms of water near the Station, two fine living specimens of the Jonah crab. These were easily kept for some time in an aquarium in the laboratory. Both were abnormal in having dark markings on the carapace, the black colour being like that of a metallic sulphide. The mud of the beach exhibits this colour where decomposition of much organic matters is going on. When one of the crabs was opened part of the digestive gland on the right side was found to be much altered, some of the tubules being black and hardened, and of a horny consistency. It would seem that such individuals of the Jonah crab as come so far into the estuary as the St. Croix river are affected unfavorably, become diseased and die; also that they keep to deep water rather than entering the intertidal zone.

Cryptacanthodes maculatus, Storer.

Advantage was taken of an opportunity for making observations on this curious and little known fish, that has been given in English the names of Wrymouth and Ghostfish. The former name seems the more appropriate one, as it describes the unusual shape of the jaws that makes the mouth open dorsally. In 1910 when collecting at low tide on certain muddy flats near the mouth of the Magaguadavic river on the east side of the bay, holes an inch or more in diameter were noticed in the mud. Digging yielded no quarry from these retreats, but while we were tramping about in the mud a wrymouth suddenly appeared. Similar action at another set of holes yielded the same result. On June 21, 1920, while at the Magaguadavic river to study the success of the smelt spawning, the flats were visited at low tide, and four

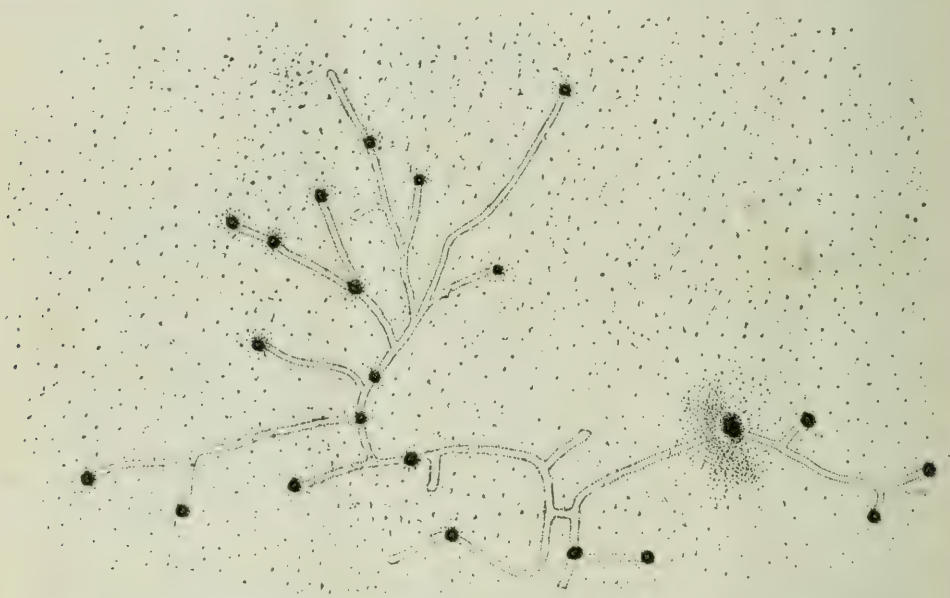


Fig. 2. — The system of burrows of a wrymouth. From a sketch (A.G.H.).

wrymouth secured, all more than 40 cm. long, that is, nearly full grown.

The burrows in which the fishes were living were found in very soft mud from the lower part of the *Fucus* zone downward, that is as far up as four feet above low water mark. Those at the highest level were in shallow tide-pools and the others in such flat situations as prevented them from ever being drained of water. Each system of burrows, inhabited by only one fish, consisted of branching tunnels about 5 cm. in diameter, and from 3 to 8 cm. below the surface. These tunnels to a certain extent radiated from a somewhat cen-

trally placed low mound about 60 cm. in diameter and 5 cm. high. In the centre of this mound was a broad funnel-shaped depression leading into the main entrance of the system of burrows. Scattered for some distance around the mound, within a circle with a radius of from three to five feet or even more, and opening from the burrows, were a number of holes of the same diameter, their margins being flush with the surface of the mud. One system was traced out by opening up all the burrows. It is represented in figure 2. It will be seen that this system is not very regular, and shows a development of the burrows almost wholly on one side of the mound. Most of the branches open to the surface, but some end blindly. The openings are to be found not only at the ends of the branches, but also at the junctions and along the course of the branches.

The fish were found to emerge, not from the main opening in the mound, but from one of the other openings, which shows that they were pointing away from the mound. We suppose that the mound opening is the point from which the burrows were formed, that the mode of formation was the thrusting of the animal's head through the soft mud, and that the other openings are necessary for the indraught of fresh water in breathing. Its method of bringing fresh water into its burrow, to be described later, is such as to cause a current to flow from the peripheral openings toward the centrally placed entrance, and from this current is doubtless deposited the material that forms the mound.

Three of the wrymouths were placed in the laboratory, in a flat, shallow tank provided with running salt water. They were heard making a very considerable commotion in the late afternoon and evening, and on the next morning one was found dead on the floor. On the following morning another was found dead. Boards were then fastened around the edge of the tank, and the remaining fish was kept without difficulty through the season.

This individual, which was about 45 cm. in length, was a male, judging from the examination made of the others. On June 24th, a piece of black, hard rubber pipe, 1⅞ inches outside diameter, 1⅜ inches inside diameter, and 8 inches long, was placed in the tank. After a time the fish entered the pipe and took up a resting position with both ends protruding,



Fig. 3. — Wrymouth reclining in a tube in the aquarium. Sketched from a photograph (A.G.H.).

but with more of the head than of the tail exposed (Figure 3). Later the head was drawn back until just concealed. The pipe rolled somewhat when the fish moved, and finally the fish left the pipe. The latter was then steadied with stones, and, when the fish again entered, it was not readily abandoned.

Locomotion.—Forward movements were accomplished by means of undulatory lateral motions of the tail and posterior part of the trunk well forward to the head, the dorsal fin of that part being kept erect. Backward movements were accomplished by pressing the tail or part of the trunk forward against objects, and by placing the pectoral fins on the bottom and turning them forwards. In forward and backward movements the median (dorsal and anal) fins were kept flexed except as men-

tioned above. A stimulation of the skin of the side by touch caused the animal to move forward when applied near the tail, and to move backward when applied farther forward.

Respiration.—Occasionally the fish retreated to a position with about one quarter of the anterior end protruding, and with the ventral parts of the pectoral fins bent back and applied to the bottom. The head and pectoral fins remained stationary, and the remainder of the body performed undulatory motions, two complete waves being observed on the fish at any one moment. The dorsal fin preceded the body slightly in the lateral movement. That a current was made to flow through the pipe was demonstrated by dropping some carmine, suspended in water, near the head of the fish. The carmine particles were drawn into the pipe. Other particles were carried alongside the pipe and past the other end. No carmine particles were observed to issue from that end, probably because of dispersion of the particles into a larger volume of water, and because the movement soon ceased. The fish seemed to be irritated to some extent by the particles. The movement lasted for from one to two minutes. On one occasion the movement was observed being carried out by the fish when it was not in the tube, but in a corner of the tank with its head against the end wall.

The respirations numbered from 12 to 20 per minute. When the animal was approached it ceased breathing for from one to two minutes. At the conclusion of this period of rest, it would either give two or three deep inspiratory gasps, opening its mouth widely, or would merely resume breathing at a somewhat more rapid rate than usual. Occasionally on resumption of breathing the lateral undulatory movements would be commenced, the anterior part of the body remaining stationary. There can be little doubt that these movements are initiated by dyspnoeic conditions, and that they are for the purpose of renewing the water in the burrows in which the fish lives.

Feeding.—The stomachs of specimens that were opened shortly after being caught contained beach fleas, or scuds, (*Gammarus locusta*), sand shrimp, (*Crago septemspinosus*), and fragments of flounder, (*Pseudopleuronectes americanus*). The specimen kept in the tank took food freely. It usually left its tube in the late afternoon, and could be heard at dusk thrashing around in the water. Scuds placed in the tank disappeared, as did also hermit crabs (*Pagurus acadianus*). It also took, when offered, small herring or sardines, limpets, periwinkles, whelks, clams, and mussels. These it would take from the hand, even reaching out of the water to seize them, and approaching from a distance of as much as a foot. Sight seemed to be as important as smell in determining its feeding, as it would show excitement by moving its tail and lifting its head, and finally move forward and snap with its jaws when the finger was held just above the surface of the water in front of it. Not only was the food seized, but also there was a strong indraught of water into the mouth that carried the food along. When the feeding was done at the surface of the water, air also was drawn in, producing the sound so characteristic of the last stages in pumping the bilge water out of a boat, when the water is mixed with air. The dorsal position of the mouth is favourable to the taking of food from above, which is perhaps the normal method with this fish. At times, however, it was seen to turn on its side in order to seize food lying on the bottom of the tank. Food taken into the mouth was either rejected or swallowed by a series of vigorous peristaltic movements of the mouth and throat. To swallow a very large piece might require considerable time, and might even result in the fish coming out of its tube for more freedom, and turning all the way over once or twice in its swallowing efforts.

Zoarces anguillaris (Peck).

A muttonfish 45 cm. in length was kept in one of the flat tanks of the laboratory during the latter half of the season and proved to be quite hardy. It fed regularly on the fish and shell-fish given it, approaching from a distance of more than a foot to take food from the hand. The enormous thick lips were used more than the teeth for taking hold of the morsels and a strong inspiration of water carried the food in. Swallowing did not immediately follow the taking of food, but was

preceded by a rather prolonged series of masticatory movements involving both mouth and throat, and in which the head was nodded vigorously by movements in the vertical plane, the downward ones being the more vigorous.

The enormous pectoral fins were used in slow backward and forward locomotion, each fin being kept in a vertical position and slightly folded with the convex side in the direction of movement. At rest each fin is held out from the body almost in the horizontal plane and against the bottom, with the dorsal part posteriorly placed and somewhat raised. Rapid swimming is accomplished by undulatory movements of the posterior part of the trunk and tail; the pectoral fins being extended to the fullest extent and held horizontally with the dorsal edge in front, while the dorsal and anal fins are kept close to the body, at least anteriorly.

Touching the side of the trunk or tail resulted in the erection of the dorsal fin. After repeated stimulation the response became rather local, extending both forward and backward from the level of the point touched, but chiefly backward. At the same time the fin was bent toward the side stimulated.

THE LIARD RIVER FLOOD OF JULY 1919.[1]

BY E. J. WHITTAKER.

In a recent issue of the *Geographical Review*[2] Dr. E. M. Kindle states that the Liard is the main source of supply of driftwood for the Mackenzie River, and that "the unusually high stage which the Liard reached in 1919 set afloat a vast quantity of stranded logs, many of which had started their northern journey in previous years." In view of the fact that this flood was unprecedented within the memories of the present inhabitants of the region, and also that the writer was ascending the Liard during the period of maximum flood conditions, the following observations are presented which may be of interest to readers of this publication.

After a quick trip from Edmonton the Geological Survey party to which the writer was attached reached Fort Simpson, N.W.T., on July 1st, 1919. This fort is situated on an island at the junction of the Liard and Mackenzie Rivers, and at no other point is there a more striking view of the width and volume of this northern waterway. Upon enquiry we were told that the flood stage of the river had reached its maximum about three days before, and had now fallen four feet below the high water mark. The following day, Wednesday, July 2, we commenced tracking up the Liard. Owing to the high water, travel was not easy, yet we hoped it would steadily improve as the river level lowered. It did actually lower until Saturday afternoon, July 5th, during which time we reached and passed the long series of rapids about thirty miles above Fort Simpson. We camped that evening on the shore opposite the lower end of Gros Cap Island, at the upper end of the canyon. During the afternoon a slight increase in the quantity of driftwood warned us that the river was once more rising. All day Sunday it rose slowly but steadily, ten inches in the twenty-four hours.

About midnight of the 6th, the noise of the water and the grinding and breaking of trees increased perceptibly. The river became quickly covered with driftwood from bank to bank and encroached rapidly upon our camp site, which had been selected for convenience rather than with an eye to floods. This site had to be abandoned. As high ground was a long distance back through a dense forest and it was now impossible to go upstream against the driftwood laden waters, which were already undermining and dropping trees into the river, we went carefully downstream three miles to Poplar river, where a bank 250 ft. high made certain that we could retreat as high as necessary, and the dead water at the mouth of the smaller stream made a secure harbour for the canoe.

We remained at this camp 4 days, dur-

[1] Published by permission of the Director of the Geological Survey of Canada.

[2] Kindle, E. M., "Mackenzie River Driftwood", Geographical Review, Vol. XI, January, 1921, No. 1, pp. 50-53.

ing which the rapids on the Poplar River above its mouth were drowned out one by one as the rising Liard backed its waters higher up. By this time the larger river was full of sediment and for drinking water we had to go farther up the Poplar, whose clear reddish waters were much more palatable. A large boulder which had been noted on the upward journey was selected as a gauge and then corresponding marks were cut on the bank. The waters rose at this point over seventeen feet in sixty hours. Unfortunately some pictures which were taken of the changed appearance of the banks were ruined by the damp weather, as the moisture penetrated even so-called waterproof tins. A conspicuous flat island at the mouth of the Poplar with a steep bank about ten feet high was completely submerged and at the height of the flood only the tops of its small spruces were to be seen. In traversing the neighbourhood, the sound of rushing river water was heard in some places a quarter of a mile and more from the river bank, while the forest was being denuded of its fallen trees and its underbrush was being flattened. On the opposite side of the river where the shore was a cut bank of till, great cracks appeared in the cliff resulting in huge long masses weighing hundreds of tons becoming undercut and detached; these fell into the river from time to time with a noise that rose even above that of the water and caused great waves which came, in spite of the driftwood, across the river to our camp.

The high water mark of the flood was reached at 3 p.m., Thursday, July 10th, and after remaining at this level for four hours, began to recede. At this time the waters were eighteen feet above ordinary high water mark. This part of the river, however, was narrow, and the waters piled up more than in the wider sections.

As soon as we were able to travel we started upstream once more and found that the banks had suffered considerably. Everywhere they had been cut back for many yards and were a mass of twisted and gnarled trees. Out in the current hundreds of trees which still were fastened to the land by their roots, swaying and twisting, were given, where possible, a wide berth by the canoe. Their numbers were increased at intervals by other trees falling into the river. Camp spots were difficult to find as the shore could only be gained at intervals owing to the above conditions, and even when we were ashore everything was covered with about six inches of soft black mud, newly deposited by the river. This latter condition was most noticeable in the "Long Reach", where the river is over a mile wide with low banks of sand and clay. There was one small point where over eight feet of sand had been deposited. Trees were dragging by their roots one hundred feet out from the cut bank, which had thus been cut back for at least that distance. At one spot at the junction of the Liard and Nahanni Rivers where there were several old Indian cabins, erosion had exposed what was apparently the ancient remains of a rude coffin. It may be said that although the river dropped slowly, it remained very high all summer, and had the Forts Liard and Nelson been obliged to depend for provisions, as in previous years, on scows brought up by trackers, they would have been late in receiving them. It was not till September, when the sandbars began to be exposed, that such transportation could have been attempted. Fortunately the new steamer of the Hudson's Bay Company was able to reach these forts in the latter half of July.

That the flood of the Liard in 1919 was unusual the following facts will show. The Hudsons' Bay Company had cut wood the previous winter all along the river for their new steamer. According to Captain Mills not a single wood pile remained, and the crew had to cut their own fuel at all times. Several buildings at Fort Liard which were almost as old as the fort itself were undercut and destroyed. Ancient log jams which had withstood the ice and floods of many previous years were entirely removed. At the junction of the Liard and Nahanni, and also up the latter stream, were two gardens and cabins of a trapper called LaFleur. Both his potatoes and house were submerged. In many cases the shore, which had been of a mature type with grass-covered gentle slopes on which were very old Indian camp sites, was converted into high steep cut banks.

Dr. Kindle in the article previously

quoted states "The vanguard of the main volume of the Liard driftwood reached Old Fort Good Hope on the Lower Mackenzie about July 13th". This vanguard reached our camp on the Liard at Gros Cap Island about midnight of July 6th. The driftwood therefore required at most about seven days to travel the distance between these two points, which is approximately 620 miles. This means that it was transported at an average rate of at least three and three-quarters miles an hour, and gives a good idea of the swift current of the Mackenzie.

The flood was caused by unusually warm and abundant rains throughout the basin of the Liard. This river rises in and drains a large area west of the main range of the Rockies between latitudes 58 deg. and 61 deg. 30 min. N. and then cuts through this range to the eastward. The warm rains not only caused the rivers to rise by their own precipitation, but also rapidly melted the mountain snows. That the flood extended to its headwaters was shown by the large number of huge trees in the driftwood common in Northern British Columbia, but entirely unknown in the lower reaches of the river. We had only six dry days out of six weeks on our trip, which accounts for the continued high water all summer.

VANCOUVER NATURAL HISTORY SOCIETY.

NATURALISTS STUDY ALPINE FLORA.

The ninth of a series of excursions held this summer by the Vancouver Natural History Society took place last week end when a party of 22 ladies and gentlemen left on Saturday to study the flora of Grouse, Dam and Goat Mountains. Amongst those present were several members of the University Summer School Botany Class which finished work the previous day, and this outing proved a fitting climax to a strenuous term of indoor lectures.

Under the leadership of the President, John Davidson, F.L.S., the party proceeded via Lonsdale, Mosquito Creek, where attention was directed to the devastating effect of erosion, which the President several years ago foretold would result if logging operations were carried on in that vicinity. It was pointed out that the people of N. Vancouver in future years will have to pay for the folly of the present generation in allowing erosion to commence through permitting a logging company to obtain a few thousand dollars worth of timber. Already trees, houses and bridges had been destroyed at this point and greater havoc is likely to take place within the next few years. Continuing, the party travelled via the B. C. Mountaineering Club's trail to the Club's Cabin, use of which had been kindly granted for the occasion. During this part of the journey attention was drawn to the changes in vegetation corresponding with the change in altitude. The trees and undergrowth at first were similar to those found around Vancouver, the Giant Cedar, Sitka Spruce, Hemlock, and Douglas Fir, with undergrowth of Salal, Huckleberries (which are more abundant than usual this year), and False Azalea, while here and there were found patches of Pipsissewa, a native plant used for medicinal purposes. Higher up, near the 2,000 ft. altitude, Western White Pine with its long cones and leaves in clusters of five became frequent, and occasional trees of Yellow Cedar and Western Yew were observed, the latter with its beautiful red berry-like fruits in evidence.

Dinner past, the evening was spent inspecting a collection of pressed plants prepared by one of the members who had recently returned from a trip through the drybelt. By this time, in spite of the light smoke screen which hung over the inlet, the lights of Vancouver were in evidence and the party spent half an hour picking out the various sections and streets of the city; motor cars and inter-urban trains were discernible by their strong head lights.

By half past six the following morning the cabin was astir, some getting breakfast ready, others packing supplies for lunch, while novices looked on with interest at how things were done by mountaineers. Breakfast past the party was divided into two sections, one, under the leadership of the Society's treasurer, Mr. Jas. Lyall, taking the direct trail from the cabin to the Plateau of Grouse; the other, under the

leadership of the President, taking the longer and more arduous route up the bluffs via Larsen's trail, both parties to meet again at the summit of Grouse Mountain.

Soon after starting on the trail, no less than three different species of Club-mosses were found on the southern slopes at 2,300 ft. elevation. Descending to a valley 1,900 feet above sea level, the party found a great variety of ferns and flowering plants, the Cliff-brake Fern — often erroneously called Parsley Fern—the Oak Fern, Sword Fern, Deer Fern, or Rock Fern; the Goats-Beard, Ocean-Spray, several Saxifrages, two species of Pentstemon with beautiful purple flowers, Dwarf Salal and numerous other species which had flowered earlier in the season and were now in fruit. The trail zig-zags onward and upward over the ledges known as Eagle Bluffs, and on these ledges sufficient soil has accumulated to support a great variety of trees, shrubs and flowering plants. Wild Roses, Black-Caps, Huckleberries, Blueberries, and Blackberries were much in evidence, and here one noticed the gradual change from lowland trees to alpine species; the Western Hemlock and Giant Cedar of lower altitudes gave place to the Mountain Hemlock and Yellow Cedar, while the Western White Pine became common, the abundance of shed needles on the trail causing some anxiety to one or two members who had omitted to provide themselves with proper foot-wear. On reaching the plateau the party inspected the area affected by fire, and, satisfied that it was safe to proceed, continued the journey which had Goat Mountain as the objective. Here they were joined by three members who missed the ferry the previous day and who, not knowing the right trail, arrived at the plateau with a limited supply of provisions and utensils and spent the night in the open.

On the plateau and regions above the forest is chiefly Mountain Hemlock, Yellow Cedar, and Lovely Fir, the latter being often mistaken and cut for White Fir, which in this part of Canada is really the Grand Fir. The underbrush consists largely of White Rhodedendron which was past its best, and the beautiful Copper-bush, while the ground is carpetted by the so-called Heather, a very different plant from any of the Scotch species.

No time was spent on Grouse summit, the party continuing to the valley between Grouse and Dam Mountains where both parties joined and started the ascent of Dam together. Here on the east slopes were found many additional alpine species, some in flower, others in fruit, the Arnica, Mountain Flea-Bane, Grass of Parnassus, Mountain Dewberry, Rosy Twisted Stalk, and mountain Mare's Tail were found in flower, while False Hellebore, Marsh Marigold, the leathery Saxifrage, and other alpine plants were found in fruit.

In the midst of these flowers the company halted by a streamlet for lunch, and in a short time the "billies" were boiling and tea served to the members, who by this time were ready to forego their higher education in order to satisfy what seemed to be insatiable appetites. This done, all were ready to proceed to the summit of Dam mountain, 4,500 feet above sea level, where a photograph was taken of the party in order to have a record of the largest Natural History excursion to this point.

Thereafter eleven of the members proceeded to Goat Mountain. In former years the intervening ridge proved a profitable region for the botanist, but this year on account of the lightness of the winter's snowfall everything had so dried up that nothing was added to what had already been found. Even on Goat Mountain, where at this time of the year on former occasions large patches of snow were found, this year the snow had completely gone and the summit was as dry as the summit of Grouse. This year, however, the comparatively rare and interesting little Saxifrage known as Tolmie's Saxifrage was found in flower, whereas in previous years it was seen just emerging near the margin of the snow patches.

At three fifteen the party retraced their steps to the Plateau and returned by the direct trail to the B.C.M.C. Cabin where supper was served. All were unanimous in the opinion that this excursion had proved the most pleasant and profitable outing held this season, though some had forebodings of aching muscles for a day or two after the trip. The party was

composed of Mrs. Douglas McIntosh, Misses Kirk, M. Bain, N. Bain, Hyndman, I. Clemens, Aish, M. Armstrong, E. Sutherland, G. Rogers (Victoria), R. Stewart, (Victoria), Thyne, and Messrs. J. Davidson, J. Lyall, F. Perry, McNair, Kirk, J. D. Turnbull, J. W. Turnbull, Wickson (Victoria), D. Nelson, R. R. Earle.

BIRD NOTES BY THE WAY IN THE MARITIME PROVINCES.

By Hoyes Lloyd.

From March to October 1919 I spent about three months in the Maritime Provinces of Canada. There were three different trips as follows: March 16—May 7; July 15—August 10; and October; the last of which may be neglected here.

Those Canadians who do not know the Maritime Provinces have not seen one of the loveliest parts of their country. Although occupied with other things, every opportunity was taken to study the birds of this territory which was new to me. Dependence upon field glasses instead of specimens for identification of some birds seen was unsatisfactory, and should anyone care to question this species or that, I must advise him to go where the spruces fringe the roadside, where the muddy tidal flats shine in the summer sunshine, and see for himself.

Leaving Ottawa on March 14th, the only common birds to be seen from the train were Crows and a single straggling flock of Horned Larks. The Crows were already common in Quebec and New Brunswick along the Intercolonial Railway on the 15th. At Dalhousie Junction, an early Grackle was seen on the top of a pine. The icy expanse of Chaleur Bay with its patches of open blue sea gave little promise of Spring, but there was the Grackle in defiance of Winter.

On March 16th I walked across the frozen St. John River from Fredericton, New Brunswick, reaching the point where a small stream flows into the St. John. A flock of 18 Snow Buntings were found and many of them were singing in chorus. They had chosen a large elm for this rather unusual performance and all perched in the branches to enjoy or participate in it. This tree was evidently used solely for this vocal performance by the flock, for they flew off but returned shortly and resumed their singing.

The song was canary-like, interrupted with twitters as in the Goldfinch and with the regular whirring flight note of the Snow Bunting. It was sweet and bubbling, being particularly attractive in a season when songs are scarce.

The historic Boardman Collection of birds is well cared for in the University of New Brunswick. Unfortunately the labels in this collection give only the names of the species and the number in Baird's check list. I examined the stands of a few of the mounted birds in a search for the usual data, but without success. Many of the mounted birds are crowded into large cases so that all but the outside birds are indistinguishable, and the cases do not open readily. For this reason it was impossible to study the collection carefully, as this could not be done without taking considerable time and putting the University authorities to a great deal of trouble.

On the 19th of March, after two days' rain which turned the snow-laden countryside into a veritable morass of snow, slush, and water, a short walk along the river road at Fredericton was taken in search of early migrants. Half a dozen Pine Siskins were found, and on the 29th others were noticed at McGivney Junction.

On that day I left Fredericton for Moncton. The ice had just left the Nashwaak River, although it still held in the swollen St. John. The American Golden-eyes had not been slow to take advantage of the open water and made pretty groups as they swam along the icy edges of the Nashwaak. Several large flocks of Grackles were travelling north up the river valley and I believe one Song Sparrow was seen.

East of McGivney Junction a Red-tailed Hawk (?) was coursing over the open barrens. At Moncton there was a dual attraction in the Petitcodiac River, the numerous Gulls and the bore, which stop-

ped the floating ice in its downward course and hurried it back upstream again. Most of the gulls were Herring Gulls, but an Iceland Gull spent April 1st and 2nd with them. This bird was smaller than the Herring Gull with distinctive white wing tips.

The first Robin arrived on the 2nd, but he must have been an optimist.

Then I resumed my journey, this time going to Halifax. There, at Dalhousie College, I was much delighted to see what I believe to be the only Canadian specimen of the Labrador Duck. It is well cared for, being kept in the vault, and is a beautiful specimen in an excellent state of preservation. This specimen, if Dalhousie would ever part with it, should be in the National Museum—perhaps the only Canadian specimen still in Canada of an extinct Canadian bird. However, I have recorded the result of my examination of this speciment elsewhere (1) and regret that its alleged mate is an American Scoter.

On the night of April 6th a flock of Canada Geese passed over Halifax in a fog.

The land of Evangeline is too well-known to need any description of its beauties on my part. Toward evening on April 8th I saw the well, the monument and the willows in the little village of Grand Pré. Before the train passed two Black Ducks were seen to rise from the meadows and sweep out over the basin of Minas. For me, the romance and tragedy of the great poem seemed very vivid whenever I visited this locality.

As I journeyed to the south-west, Song Sparrows and Robins became common. The latter were flying up the Annapolis River in flocks. Many of the birds reaching south-western Nova Scotia must cross some 30 miles of open sea at the mouth of the Bay of Fundy. Study of the migration with respect to this crossing would seem to offer attractive possibilities.

At Digby, on the 9th, Juncos, Chickadees and a pair of Goldfinches were noted. A pretty flock of eight Long-tailed Ducks was enjoying the spring sunshine on the waters of Annapolis Basin.

During a short stroll in the woods at Barrington Passage a single Ruffed Grouse was found. I had not enough time in the woods this trip to be able to say anything concerning their abundance; but they were reported as abundant in New Brunswick in October. Cape Sable Island, at the south-western extremity of Nova Scotia, was disappointing at this season.

Black-backed Gulls—half a dozen of them at least — on the waters of the Atlantic near Halifax, made an interesting sight, for I fear I had grown rather blasé toward common and more inland species.

At Halifax on the 14th of April Juncos and Siskins were noted in number, but the 24th brought a real little wave of migration to the shores of the north-west arm. The first Warbler of the year, a Myrtle, was encountered then, the Juncos were still present, but the real event was a flock of twelve Brown-capped Chickadees. For fear I would mistake their very different notes and habiliments a Black-cap was travelling with them to show how different he really was. If similar species of birds would do this regularly it would save much trouble for the student of birds.

On May 3rd at Amherst, Nova Scotia, a bright afternoon found me on the dyked meadows worrying—if one could really worry on a bright warm day of Spring—about Sparrows. Savannah and Song Sparrows greeted the sunshine with song, and Vespers were noted; Robins had become numerous.

Northumberland Strait between Pointe du Chêne, N.B., and Summerside, P.E.I., was clear of ice on May 5th, and abundant bird-life made the crossing of interest. Flocks of Scoters flushed ahead of the steamer continuously — the identified ones indicating the proportion of each species present. My estimate of these was 30 American, 30 Surf and 20 White-winged Scoters. One Red-throated Loon was noted in the dozen Loons seen, while 550 Herring Gulls and a single Great Black-backed Gull completed the Gull list.

Tree Swallows, Barn Swallows, Grackles, Robins and Juncos had already reached Prince Edward Island when I left on the

[1] Fleming saw one in Montreal some years ago which was not the specimen purchased by Dutcher, but its present condition, if still in existence, is unknown.

7th although snow-banks still persisted. The return crossing of the straits brought nothing new and I left the Maritime Provinces, returning at mid-summer.

Many birds which occur in the interior of New Brunswick shun the vicinity of St. John, or are rare. The Bluebird is probably an example of this. On July 20th birds seen on a trip to Seaside Park were: Herring gull 25; Nighthawk 6; Kingbird 2; Grackle 4; Song Sparrow 6; Purple Martin 2; Barn Swallow 6; Crow 12; Yellow Warbler 1; Maryland Yellowthroat 1; Robin 1.

A young Nighthawk brought to me in the flesh seemed very dark and was duly prepared into a birdskin. The trials of travelling were brought home to me when skin, wrapping, and all were dragged away to make a cosy nest for the mouse who lived behind the hotel wash-stand.

Bird life was abundant at Digby on the 22nd. Among the shore-birds were the ever-present Spotted Sandpiper and flocks of Leasts or Semipalmated, or both, moved up and down the broad mud flats in compact batallions. Novelties to me among the land birds were a flock of Purple Finches at midsummer, and a Blue-headed Vireo in full song.

July 24th was an eventful day. The morning was misty and hot — the kind of morning that fits the song of the Black-throated Green Warbler. The breeding ground of the Willet was our destiny, and once reaching it the birds fairly thrust themselves upon us. The air was filled with their cries and their beautiful poise in alighting would charm any nature-lover. Almost 40 were seen.

Semipalmated Plovers had now appeared among the migrant shore-birds, and a single Piping Plover was noted in the crowd. A flock of Black Ducks rose from the salt marshes and young Acadian Sharp-tailed Sparrows were just able to fly.

A summer evening near Digby is made beautiful by the song of the Hermit Thrush in the Spruces, the last calls for the day of the Alder Flycatcher in the thicket and of the Olive-sided standing sentinal on a tree-top, while overhead the Nighthawk booms in the twilight.

In Charlottetown from August 2nd-6th, the southern migration of land birds appeared to be under way in spite of delightful summer weather. Some common birds noted were: Kingfishers, Downy Woodpeckers, Flickers, Nighthawks, Hummingbirds, Kingbirds, Olive-sided Flycatcher, Blue Jay, Crows, Goldfinch, Siskins, Red-eyed Vireos, Myrtle Warblers, Chickadees and Robins.

The Gulls and Terns frequenting the harbour puzzled me, I must admit. The Kittiwake I am fairly certain of, and Common Terns were doubtless present.

The Black-backed Gulls were now accompanied by young of the year, and a graceful group they made on the stone breakwater near Borden.

But ever-pressing work drove me from contemplation of the beautiful sea-scape and land-scape of our Eastern Provinces, which have distinctive charms all their own.

PROSECUTIONS.

MIGRATORY BIRDS CONVENTION ACT AND NORTH-WEST GAME ACT BY OFFICERS OF THE DOMINION PARKS BRANCH AND ROYAL CANADIAN MOUNTED POLICE.

Migratory Birds Convention Act. Nov. 1, 1920 *and Feb.* 1, 1921.

Placide Normand, Bonaventure Is., Percê, Gaspé Co., P.Q., possession of four young live Gulls. Birds seized and released. Suspended sentence.

Uldéric Drouin, Ste. Famille, Montmorency Co., P.Q., offering Herring Gull for sale; refusing information, forcibly resisting arrest. Bird forfeited. Fine $15.00 and costs.

Russel C. Clark, Mount Stewart, Queens Co., P.E.I., possession of two Canada Geese. Forfeited Canada Geese and one shot gun. Fine $10.00 and costs of Magistrate's Court and Supreme Court of Prince Edward Island.

W. Boyle, 41 Marlboro St., Toronto, possession of one mounted Pileated Wood-

pecker. Specimen forfeited. Fine $10.00 and costs.

Jno. Gray, 59 Marmaduke St., Toronto, possession of one mounted Pileated Woodpecker. Specimen forfeited. Fine $10.00 and costs.

W. Raine, 50 Waverley Rd., Toronto, possession of eggs of migratory birds. Adjourned till called.

Geo. McNair, River Charlo, Restigouche Co., N.B., possession of one mounted Pileated Woodpecker. Specimen forfeited. Case dismissed.

Frank Woodworth, Campbellton, N.B., possession of one common Loon. Specimen forfeited. Fine $10.00 and costs.

O'Neill Bros., St. John, N.B., selling Black Ducks. Fine $100.00.

O. Trafford, St. Eugene, Ontario, possession of one Great Blue Heron, one Pileated Woodpecker, and one American Golden-eye. Specimens forfeited. Fine $10.00 and costs.

G. F. Cunningham & Co., St. John, N. B., selling Black Ducks. Fine $100.00.

Napoléon Pineau, North Rustico, Queens Co., P.E.I., attempting to kill a migratory game bird between the hours of sunset and sunrise. Fine $10.00 and costs.

James Grant, Oulton's Post Office, Westmorland Co., N. B., killing a Great Blue Heron. Fine $10.00 and costs.

In addition to above the following bird specimens have been forfeited:

Lang & Gilchrist, Owen Sound, Ontario, Great Blue Heron.

H. G. Morley, 162 Queen St., Toronto, Yellow Bellied Sapsucker.

W. Martin, Hanover, Ontario, Mourning Dove.

G. D. Brown, 26 Holgate St., Allandale, Ontario, Mourning Dove.

E. A. Laughter, Pakesley, Ontario, Pileated Woodpecker.

W. J. Mowers, Parry Sound, Ontario, (2), Rose-breasted Grosbreaks, Catbird, Scarlet Tanager.

G. F. Richman, Toronto, Ontario. Herring Gull.

Mr. Lepage, St. Eugene, Ontario, Hairy Woodpecker.

Dr. Munroe, St. Eugene, Ontario, Pileated Woodpecker.

W. Lacombe, St. Eugene, Ontario, Pileated Woodpecker.

O. Beecraft, Hamilton, Ontario, Pileated Woodpecker.

G. A. Doan, Hamilton, Ontario, Leon.

A. L. & S. M. Clarke, Darling's Is., N.B., American Merganser.

The Game Conservation Board of British Columbia has furnished the Dominion Parks Branch with a summary of 1920 prosecutions under the British Columbia Game Act, which amount to violations of the Migratory Birds Convention Act. This summary is given below:—

Description of Offence	Dismissals	Suspended Sentence	Convictions	Total Number of Cases	Fines & Penalties Imposed
Possession of Ducks during the close season	1	1	4	6	$500.00
Possession of Ducks over bag limit			2	2	85.00
Killing Ducks during close season			8	8	125.00
Hunting Ducks from Power Boat			6	6	285.00
Possession of Geese during close season	1		2	3	75.00
Possession of Wild Pigeons during close season			3	3	110.00
Killing Sea-Gull			1	1	10.00
Total	2	1	26	29	$1,190.00

BRIEF REPORT OF THE OTTAWA FIELD-NATURALISTS' CLUB FOR THE YEAR 1920.

During the 42nd year of its existence the Ottawa Field-Naturalists' Club activities, which include lectures, field excursions and the publication of the Canadian Field-Naturalist, have been directed toward the popularizing and diffusing of knowledge of the natural sciences.

The club membership now numbers approximately 600.

A list of thirty-six lectures to be given by club members was sent to local societies, clubs, churches and schools from which they might select and request desirable talks, and as a result over 60 lectures on the following subjects were delivered: A Survey of a Prehistoric Indian Village, The Iroquois Indian, Folk Balladry of Quebec, Ranch Life, Bird Sanctuaries, A Trip Through the Peace and Mackenzie River Region, The Birds of Bonaventure Island, Birds of Eastern Canada, Bird Protection in Canada, Winter Birds and Mammals, The Migratory Birds' Convention Act, The Copper Eskimo, The Indians of Canada, Instances of the Influences of Physical Environment on the Indians, Amphibians and Reptiles, Canadian Birds, How and Where We get Dinosaurs, Canada's Natural Resources, Some Phases of Life and Scientific Work in the Canadian Arctic, Meteorites, Nautral History of Lac Seul. The feature lecture of the year was delivered by Dr. Otto Klotz, Dominion Astronomer, at the Peoples' Forum under the auspices of the Ottawa Field-Naturalists' Club.

Five field excursions were held as follows:—May 1, Geology, Rockcliffe Park; May 15, General Natural History, Catfish Bay; May 29, Botany and Ornithology, Fairy Lake; June 12, Entomology, Aylmer; June 26, Horticulture, Central Experimental Farm. Scientific men attend the excursions to direct interest and answer questions.

The Canadian Field-Naturalist, the official organ of the club, is now being used as a medium of publication by five affiliated societies as shown on the back cover.

The officers and committees for the year 1921 are as follows:

President, R. M. Anderson; Vice-Presidents, Hoyes Lloyd, G. A. Millar; Secretary, Clyde L. Patch; Treasurer, C. B. Hutchings; Editor, D. Jenness; Past-President, M. Y. Williams.

Additional members of Council: W. T. Macoun, Miss M. E. Cowan, P. A. Taverner, H. I. Smith, C. M. Sternberg, E. Sapir, E. M. Kindle, F. W. Waugh, W. J. Wintemberg, R. E. Delury, Arthur Gibson, Norman Criddle.

Standing Committees of Council.

Publications: Hoyes Lloyd, W. T. Macoun, Harlan I. Smith.

Excursions: F. W. Waugh, C. M. Sternberg, G. A. Millar, Miss M. E. Cowan, C. L. Patch, C. B. Hutchings, W. T. Macoun, H. Lloyd.

Lectures: Harlan I. Smith, P. A. Taverner, W. T. Macoun, G. A. Millar.

Trust Funds: W. T. Macoun.

Auditors: J. Ballantyne, E. C. Wight.

Leaders at Excursions.

Archaeology—Harlan I. Smith, F. W. Waugh, W. J. Wintemberg, C. M. Barbeau, Dr. E. Sapir.

Botany—G. A. Millar, W. T. Macoun, Mrs. A. F. Brown, Dr. M. O. Malte, E. C. Wight, Miss M. E. Cowan.

Entomology—C. B. Hutchings, Arthur Gibson, J. M. Swaine, F. W. L. Sladen.

Geology—Dr. E. M. Kindle, Dr. M. Y. Williams, H. McGillivray, E. Poitevin, Dr. M. E. Wilson.

Ornithology—P. A. Taverner, C. L. Patch, Dr. M. Y. Williams, A. G. Kingston, Hoyes Lloyd, R. E. Delury.

Zoology—Dr. R. M. Anderson, A. Halkett, C. L. Patch, E. A. LeSueur, C. H. Young, C. E. Johnson, E. J. Whittaker.

Photography—W. S. Hutton.

NOTES AND OBSERVATIONS.

MR. ARTHUR GIBSON — AN APPRECIATION.

With the last number of the CANADIAN FIELD-NATURALIST, Mr. Arthur Gibson, who has been the editor since 1910, ceased to fill that position, his increasing official duties having made it necessary for him to send in his resignation.

Seldom has an editor of a periodical which depends for its success on voluntary contributions, and has but slender means of support, served so long and faithfully and satisfactorily as has Mr. Gibson. His work must surely have been a labour of love or he could not have continued to edit the Naturalist for all these years. Only those in close touch with the work of the Ottawa Field Naturalists' Club and its organ know the tact and skill necessary to obtain matter for the *Naturalist*, and the popularity of Mr. Gibson among the contributors and the members of the Ottawa Field Naturalists' Club is a sufficient tribute to the manner in which he conducted the editorial work. Mr. Gibson by his many personal contributions also showed himself to be deeply interested in the success of the *Naturalist*, as often in a periodical of this kind the extra matter which the editor contributes from his own pen assures the publication of a satisfactory number.

Beginning with Volume XXXII, the *Ottawa Naturalist*, which had been published since 1887, was issued in the larger and more attractive form in which it appears to-day and the title changed to the *Canadian Field-Naturalist* to give it a wider field. This larger edition meant an increase in the editor's work, which Mr. Gibson cheerfully assumed.

We feel that all members of the Ottawa Field Naturalists' Club and subscribers to the *Canadian Field-Naturalist* must deeply regret the resignation of Mr. Gibson as editor, but at the same time appreciate his many years of unselfish devotion, and, in releasing him from his duties as editor, wish him much success as Dominion Entomologist.—W. T. M.

THE SPRUCE DRUMMER.—In spite of the fact that the Canada Grouse, or Spruce Partridge, has for many years enjoyed continuous protection, its numbers appear to be slowly diminishing. In view of the characteristic stupidity of the species, this is not surprising. It is now seldom found except in the more remote woods and swamps. Here on a fine morning or evening in the autumn the moose hunter listening for antlered game may often be distracted by repeated flutterings as if a large flock of birds were feeding in some nearby grove. If he takes the trouble to investigate he is probably surprised to find that all the fuss is made by one bird, a spruce drummer (Spruce Partridge) who is ardently engaged in his exercise, or pastime, of drumming. He no doubt goes through this performance for the same reasons that the cock crows, or the cock robin sings. It is an assurance to his mate and a challenge to his rivals. The methods of this performance, however, seem further to justify the name of "fool hen" by which his species is sometimes known. His favorite location at such a time is between two trees standing apart some twenty or thirty feet, and with their lower branches large and horizontal. Perched on one of these branches he pitches downward, pausing midway to beat and flutter his wings, and ascends to a branch of the opposite tree. After a short interval this manoeuvre is repeated and so continued by the hour, swinging back and forth from tree to tree, the time between each swing being as exact as if measured by a watch. If such an ideal situation is not at hand the fact does not prevent the "fool hen" from giving vent to his exuberance. Selecting a small open space among the bushes, he takes his stand in the centre and like a jack in the box pops up a few feet in the air and giving his triumphant flutter drops again to earth. This method lacks the grace of the former, and when thus engaged the bird seems to justly merit the title of "Fool Hen". The sound produced by the drumming of the Canada Grouse can in no-wise compare with that of the ruffed grouse; it has neither the roll nor the volume. It is in fact little more than a flutter, such as might be made by birds forcing their way through thick branches after buds or berries. Unlike the Ruffed Grouse, however,

he seems to have no very strong objections to an audience. The performance of the birch drummer (Ruffed Grouse), can only be witnessed by the exercise of stealth and caution, Our little Spruce Partridge on the other hand will peer and look at the intruder and then, as if suddenly remembering, go through his evolutions with a gusto that excites our startled amusement. Though the drumming of the grouse is peculiar to the male its practice is not confined to the nesting season alone, but may be heard in any month of the year and occasionally at any hour of the day or night.

J. L. DEVANY.

SOME OBSERVATIONS ON BLANDING'S TURTLE.—During the summer of 1920 I spent several weeks at Point Pelée, Ontario, with a collecting party from the Royal Ontario Museum of Zoology. The first Blanding's Turtle (*Emys Blandingii*) was taken on June 15th, and from then until I left — July 23rd — it was much in evidence. The Point, having but a slight elevation above Lake Erie, permits many temporary rain pools apart from the main marsh, and it was in these pools, and along the sandy east beach, that most of the turtles were seen. At this season their terrestrial wanderings may mean a search for suitable sites to deposit their eggs, although it is known that this species is not strictly aquatic. However, I believe the majority of those seen on land were females — at least, those collected show this to be true.

At 6.30 p.m. on the 22nd of June I found two turtles preparing to deposit their eggs. Being determined to watch the process in spite of an empty stomach, and the hour for the attack of Point Pelée's mosquitoes drawing near, I kept one specimen under observation until excavation was fairly under way. Then, crawling within ten feet of the turtle, I watched the procedure without its showing any signs of fear.

Bracing itself up with its front feet, it dug with the hind feet, slowly carrying the sand to the surface on the upturned sole. In digging, the hind feet were always used alternately, the sand being placed first to the right and then to the left of the hole. While using one hind foot in scooping from the bottom, the other was rested against the side of the hole, helping the turtle to raise itself in order to lift the sand to the surface. After the hole was two or three inches deep, the turtle settled back so that the edge of the carapace rested on the rim of the hole. In this position, and by extending the hind legs, quite a depth was attained. After three quarters of an hour this operation was completed. My presence, however, may have retarded the work.

I estimated the hole to be seven inches deep with a surface opening of three and one-half to four inches in diameter. This broadened out below the surface, making a flask-shaped chamber about seven inches in diameter. After one egg had been dropped, I returned to camp.

Later, I returned with another member of the party and found the location. There was not the slightest sign of depression or mound, and upon digging for the eggs we found the sand well packed. The eleven eggs were transferred to a box of sand in camp, where they were left exposed to the weather. We expected to hatch them and learn the time required for incubation, but an unfortunate accident happened to them on August 26th. Another member of the party was able to examine the broken eggs and preserve several fully formed young turtles. They would evidently have emerged in a short time, but the exact period of incubation was impossible to determine. However, it would have been something over sixty-five days.

BEHAVIOR OF CAPTIVES.

The party carried back a number of adult live specimens of Blanding's turtle which were easily kept alive in captivity. They fed upon earth-worms, dead fish and meat scraps, taking food readily, both under and out of the water. After a few days they showed no signs of fear, and were frequently handled without their closing the hinged plastron.

Without a suitable place to deposit their eggs, Blanding's will retain them for a considerable time. One specimen collected when digging the hole, retained the eggs for at least thirty days. I believe this to be injurious to the turtle if postponed too long. One specimen that died in mid-

winter had a number of fully formed eggs taken from it. Other individuals relieved this condition by depositing their eggs in the water in the tub which confined them. Unnatural surroundings are almost sure to produce unnatural behavior.

L. L. SNYDER,
Royal Ontario Museum of Zoology,
Toronto, Ont.

HORNBY'S PETREL.—Through the generosity of Dr. L. C. Sanford, of New Haven Conn., the Victoria Memorial Museum has lately come into the possession of a specimen of Hornby's Petrel, *Oceanodroma hornbyi*.

For many years it has only been known from the type specimen in the British Museum obtained by Admiral Hornby, previous to 1853, and has for long appeared on the Hypothetical List of the American Ornithologists Union on the basis of its vague locality, "N. W. America", as given in the Catalogue of *Birds of the British Museum*.

In the *Auk*, XXXIV, 1917, p. 466, H. C. Oberholser advocates its installation as a fully accredited American bird on the grounds that at the time of its capture Admiral Hornby had his headquarters on Vancouver Island and there is little doubt that it was obtained in adjacent waters. It is seen that the probability of its being a Canadian species is suggested by the same evidence. It should likely be placed on our hypothetical list until further substantiated by specimens.

There are few North American birds of which we know so little as we do of the Petrels and their allies. Many nest in the southern hemisphere on lonely rocky islets lost in the vast oceanic wastes. With such limited breeding areas the total number of some of them must be very small and subject to accidental vicissitudes. The introduction say of rats from a wrecked ship might and probably has before now wiped out entire species or left them on the verge of extinction. Pigs, goats and cats have had such effects on many such insular habitats. Few of these stations are ports of call, some are inaccessible except in the calmest weather, and their dangerous possibilities and lack of resources cause mariners to give them a wide berth; hence their biota has seldom been investigated.

Petrels are purely pelagic and spend their lives far at sea in vast irregular wanderings, making no regular migration except at such times as the duties of reproduction call them to these out-of-the-way shores. They flit across the pathway of shipping and are seen in passing by the deep-water sailor; but by the coaster or the long-shoreman they are seldom noted. The former has no time to stop, investigate or collect, and the latter no opportunity. Of many species it is only the accidental straggler that normally comes to the eye of science, and probably a greater proportion of species are known by individual specimens in this group than in any other class of birds.

So it remained with Hornby's Petrel until R. H. Beck, collecting for Dr. Sanford eighty miles off the Peruvian coast in 1913, happened to come upon a number and obtained a series of them, of which this specimen is one.

The generosity of this donation to our National collections indicates that Dr. Sanford regards ornithology as more than the amassing of specimens; he refused to take advantage of his opportunity to retain the material and make his collection unique in the possession of this rare species. Whilst this spirit is not rare enough amongst naturalists to excite remark it is none the less worthy of approbation, especially as there are instances where less breadth of view and generosity have been evident.

P. A. TAVERNER.

NOTES ON THE BEHAVIOUR OF THE CHIPMUNK—No. 2.—While in camp at Lake Missanag, Frontenac County, Ontario, during part of August and September 1920, I was able to add a few notes to my record of the behaviour of the Chipmunk (*Tamias striatus lysteri*). The Chipmunk with the very short tail, upon which I made the observations recorded last year (*Can. F.-Nat.*, Vol. XXXIII, p. 92), had disappeared from her haunts of last year, nor was she to be found anywhere in the vicinity. This was a decided disappointment, as I had hoped to find out something in regard to the duration of memory in this species. The burrow in which another individual had lived the previous fall was also deserted. However, seeing a Chipmunk about a large

Hemlock stump at the edge of the woods near my camp I placed kernels of corn and raisins on top of the stump, and was rewarded not only by *one* Chipmunk coming to carry off the food but *three*, and this gave me an opportunity to make a few observations on the social behaviour of this species. Two of these Chipmunks were very similar in size and coloration, the only difference being that the stripes on the side of the head of one were slightly more distinct than those of the other, but the third was easily distinguishable by its duller coloration, slightly larger size and the obscureness of the stripes on the side of the head. I shall call them Nos. 1, 2 and 3, in the order named above.

No. 1 and No. 2 were very friendly and on one occasion I saw them rub noses. No. 3 was not amiably disposed towards the others and if either of them were on the stump when it arrived it chased them away. Sometimes pursued and pursuer would go round and round the stump like a flash of light, exhibiting marvellous agility in racing about on its smooth sides. In their general manner Nos. 1 and 2 were much alike, and neither of them paid much attention to me, even when quite close at hand, once they had overcome their first shyness; but No. 3 was always "jumpy" and was not noticeably tamer at the end of the period of observation than at the beginning. No. 1 was the most confiding of the three, and on the third day allowed me to approach within a foot of it, while on the ninth day it took food from my hand.

Yellow-jackets (*Vespula diabolica*) were extremely abundant, and many came to feed on the raisins and boiled corn that I placed on the stump for the Chipmunks. One day No. 2 was stung on the front paw and shook it violently, then licked it.

I have seen it asserted that the Chipmunk is a poor climber, and that it rarely ascends trees. Though from past observations I knew this to be untrue, I determined to put the climbing ability of this species to a fairly severe test. Making a stake from a very smooth pole of Paper Birch five inches in diameter, I drove the stake into the top of the stump, then fastened kernels of corn at intervals up the stake and placed some corn on the top of the stake. No. 1 came along, climbed the stake, taking the kernels on its side as it went up, and sitting up on the top filled its pouches with the corn it found there. Next time it came it hunted over the top of the stump, and finding no corn there, climbed the stake and took the supply I had placed there. Thus this little experiment not only showed the climbing ability of this species, and enabled me to take a photograph of it in the act of climbing, but also gave another example, in addition to that reported last year, of the rapidity with which the Chipmunk forms associations.

Do Chipmunks habitually climb to secure any of their items of food? In the case of Hazel-nuts (*Corylus rostrata*) they certainly do, as the Chipmunks I had under observation climbed these shrubs, cut off the nuts and carried them away. Moreover they do not appear to waste any time cutting off bad nuts, as all the nuts left on these bushes after the Chipmunks had visited them proved on examination to be bad. How they distinguish good from bad nuts, and how they deal with these nuts in removing the hulls which are beset so thickly with irritating bristles which stick tenaciously in the human skin, are among the few thousand things we do *not* know about our common wild mammals.

A. BROOKER KLUGH.

ARCHAEOLOGICAL EVIDENCE CONCERNING THE PRESENCE OF THE GRAY FOX (*Urocyon* sp.) IN ONTARIO.—Among the animal remains found during my exploration last summer of the Uren village site in South Norwich township, Oxford county, Ontario, are several lower jaws and part of a skull which Dr. Gerritt S. Miller, curator of the Division of Mammals, U. S. National Museum, has identified as those of the Gray Fox (*Urocyon*). While bones of this animal have been found by archæologists in Ohio,[1] Pennsylvania,[2] and Connecticut,[3] this discovery in Oxford county is probably the only record of its presence in Ontario, beyond the vague statement by Audubon and Bachman that "in Canada we have heard of its occasional, but rare appearance."[4]

The Gray Fox seems to have been as common as the Red Fox, of which we also found several bones, but it probably never

was as abundant in this part of Ontario as in southern Ohio, where the Baum village site, explored by W. C. Mills, alone yielded "over two hundred lower jaws and twenty fragmentary skulls."

W. J. WINTEMBERG.

[1] See Mills, William C., Explorations of the Gartner Mound and Village Site, Reprint from the Ohio Archaeological and Historical Quarterly (Columbus, 1904), Vol. XIII, p. 32; Explorations of the Baum village Site, Reprint, idem, 1906), Vol. XV, p. 29; and Archaeological Remains of Jackson County, Certain Mounds and Village Sites in Ohio (Columbus, 1912), Vol. 2, Part 2, p. 80. See also Langdon, Frank W., The Mammalia of the Vicinity of Cincinnati Journal Cincinnati Natural Society (1880), Vol. II, p. 297

[2] See Mercer Henry C, An Exploration of Durham Cave in 1893, Reprint from Publications of the University of Pennsylvania, (Boston, 1897), pp. 156, 159, 161, 171 and 173 (footnote).

[3] See MacCurdy, G. G., The Passing of a Connecticut Rockshelter, The Am. Journ. of Science (1914), Vol. XXXVIII, p. 517.

[4] Audubon, J. J., and Bachman, Rev. J., Quadrupeds of North America, (New York, 1849), Vol. I, p. 172.

EDITORIAL NOTE.

Owing to a variety of causes it has been impossible to start the new volume of the Canadian Field-Naturalist at the beginning of the calendar year. The last number of Volume XXXIV was nearly five months overdue on account of the difficulty the publishers experienced with their paper supply. Our new publishers promise us steady production, so, if our numerous contributors will co-operate by furnishing clean type-written material, the editor hopes to overtake his arrears and finish up the present volume at the proper time.

Subscribers to the magazine will welcome a brief statement of the financial difficulties with which the club has to contend. The total number of subscribers on the books at the end of 1920 was 560. The annual subscription, formerly $1, was raised to $1.50 to meet the increased cost of publication; but there were 403 subscriptions overdue, representing an amount of $564. The actual cost of publication is slightly greater than the amount obtained from subscriptions if every member pays his dues, the balance being made up from advertisements and the sale of extra copies. The finances of the club are therefore very restricted, and every member is urgently requested to assist the treasurer by sending in his subscription as soon as it falls due.—D. J.

THE CANADIAN FIELD-NATURALIST

VOL. XXXV. OTTAWA, ONT., FEBRUARY, 1921 No. 2

THE LARGER FRESHWATER — CRUSTACEA FROM CANADA AND ALASKA.

By Frits Johansen.

(*Continued from Vol. XXXIV, p.* 148.)

III. Euphyllopoda (Branchiopoda).

The crustacea belonging to this order comprise the three super-families of the "fairy shrimps" (Anostraca or Branchipididae) the "tadpole-shrimps" (Notostraca or Apodidae), and the "clam-shrimps" (Conchostraca or Limnadidae (Estheriidae). Most of the species are of a fair size and easily observed at the right time of the year by any one interested in freshwater life.

They derive their name from the fact that most of the appendages ("feet") behind the mouth parts are peculiarly formed so as to serve as respiratory or locomotory organs, being divided up into many hairy leaves or flagella. When present the tail has no appendages, with the exception of its last joint, and the body is composed of a great number of segments.

From olden time, these interesting crustacea have attracted both laymen and scientists, not only because of their peculiar biology (seasonal occurrence, etc.), but also because they have been considered as representing a very ancient type of crustacea, if not the origin of that numerous and widely distributed class. At any rate, fossil remains of these crustacea or similar forms have been found in deposits of great age; viz. Conchostraca from the Devonian, Notostraca from the Trias, and the Anostraca from the Oligocene (Tertiary) on.

The first important works on these crustacea were published by the Danish Zoologist O. F. Muller in the latter part of the 18th century; since then a great number of workers in different countries have studied them very carefully, of whom G. O. Sars in Norway, W. Baird in England, C. C. Claus in Germany, E. Daday de Dées in France, and A. S. Packard in the United States, have probably contributed most (see bibliography).

A. Fairy-shrimps.

The first sub-order (super-family) Anostraca is easily distinguished from the two others by the lack of a shell (carapace) and by the elongated shape of the body, in which the head is distinctly marked off.

The general form of these "fairy-shrimps" has been often described and may be assumed to be fairly well known, [1] so that only the essential points need be referred to here. The head carries two pairs of feelers (antennæ) of which the first pair is short and slender, but the second pair much longer and stouter and is in the males extraordinarily developed as clasping organs (for use during copulation), and of greatly varied form often with accessory appendages, etc. On the front end of the head is situated a simple unpaired, median eye, remnant of the large nauplius-eye of the larval stage. More conspicuous, however, are the two large, composite eyes on short peduncles which are very movable and have brilliant, metallic colours. The mouth (on the under side) is supplied with various masticatory parts (maxillæ, mandibles, etc.), and behind them follows a greater (11 or 17-19) number of ambulatory trunk-limbs, the foliaceous, hairy legs, of which the first and last pairs are the shortest. They are admir-

[1] See Ottawa Naturalist, July, 1895 (A Halkett) and April, 1890 (E. E. Prince).

ably suited for propelling the animal, moving consecutively, as grain stalks before the wind, but they have also respiratory importance, being subdivided into inner and outer parts, and even those far from the mouth have "gnatho-bases" (chewing parts), and pass along by their movements any food that is secured. The last pair is modified for reproductive purposes. The conspicuous genital organs mark the boundary between the prae- and the post-genital regions, both mostly of about the same length. With the ripe males the copulatory organ presents a mostly bifid, smaller bag; while with the females it is an oblong or more rounded (elliptical) sack containing, at the right time of the year, the eggs. The tail is mostly long and slender and consists of 8-9 joints; it ends in two furcal rami (cercopods), only exceptionally united (*Thamnocephalus*).

Except when strongly colored the animals are so transparent that the internal parts are to be seen plainly with a magnifying glass; most conspicuous is the long slender "heart" extending through nearly all the trunk-segments (somites) dorsally and with a pair of openings (ostia) on each of these. The alimentary canal is also conspicuous, owing to the food filling it out; it is seen stretching as an almost uniform tube to the end of the last tail segment, where it opens. The maxillary gland (excretion organ) is also conspicuous on the underside of the head (it is especially large in the younger stages); and in the males the white testes and their auxiliary organs (vasa deferentia) are plainly seen in living individuals, though not so conspicuous as the female's unripe (ovarial) or ripe eggs. Less conspicuous are the ladder-like nervous system (though the brain is large and well defined) and the little differentiated blood vessels.

The fairy-shrimps have this in common with most of the crustacea, that their young stages are quite unlike the full-grown animals. The egg hatches into a larva, the so-called nauplius or metanauplius. It is often only the size of a pin-head, but usually of a vivid, red color, and of an oval or pear-shape. The first pair of antennæ is longer than in the full-grown individuals and pointed directly ahead; they are probably used as balancing more than as locomotory organs. Between them is the large median eye. There follows the second pair of antennæ greatly developed as the principal swimming organs and divided up into several long, spined branches. Of the mouth parts the mandibular-palps are the most developed and leg-like; they also help in swimming, having long hairs. The somites carrying the foliaceous legs are little differentiated, and the more posterior ones as yet only represented by hairy serrations on the under side of the "abdomen". No tail is yet present, the hind-end of the larva being rounded-tapering. These nauplii make up for their inconspicuous size by their violent movements; they probably subsist right after hatching for a time on the yolk they contain.

The nauplius grows rapidly both in length and in the development of the appendages and soon reaches the metanauplius stage, which is so-termed owing to the presence of larval and adult characters. Thus the second pair of antennæ and the mandibular palps are still large and the principal swimming organs, and of the foliaceous legs and abdominal segments only the foremost are developed to any extent and well marked off from the succeeding ones The tail is short and clumsy and little differentiated from the abdomen, merely tapering from the latter. On the other hand there are now besides the median nauplius eye two large composite eyes, though their peduncles are less pronounced than in the fullgrown individuals; and the maxillary gland seems to reach its highest development (size) in the metanauplius stage. The more oblong shape of the whole body, the beginning differentiation and development of somites and foliaceous legs and tail, and the proportions of the various appendages compared with the length of the whole animal, also make this stage very distinct from that of the nauplius.

Gradually the metanauplii grow in length and take on the appearance of the adults. The foliaceous legs all become fully developed and assume their locomotory duties, and simultaneously the second pair of antennæ becomes more rudimentary (females) or transformed into the claspers (plus accessories) of the males.

The mouth-parts lose their former locomotory functions and become limited to masticatory processes. The genital organs begin to appear and the tail grows rapidly in length, so that soon the shape of the adult is reached, and only the particular development of the claspers and the genital organs remain. The eggs of the fairy shrimps apparently do not all hatch at the same time (day). I have observed how nauplii and metanauplii or young and full-grown individuals are present together in the same pond, though the great majority of the individuals are either in one stage or the other.

The fairy-shrimps are of a transparent reddish, yellowish, blueish or greenish color, more pronounced on some parts of the animal than on others. Besides, certain species, especially the females, have additional strong purple, violet, brownish or black colors in patterns characteristic for each species, though there is great variety in the intensity in the various individuals. In the males the most strongly colored parts of the body are generally the claspers (second pair of antennæ) and in the females the parts near the ovarium; also the underside of the head, the foliaceous legs and the tip of the tail in both sexes. The ripe eggs have a strongly yellow, orange or light brown color.

The fairy-shrimps swim in the water with equal facility upon the belly or upon the back, according to whether their food is above or below them in the water. Locomotion is accomplished by means of the foliaceous legs and by the long tail serving as a rudder; when disturbed they will make a sudden jerk with the tail and dart in one or the other direction. Where there is a strong current in the pond (lake) in which they live they will go with it though moving their foliaceous legs all the time; in quieter pools, the younger individuals especially (metanauplii and slightly older ones) will float in the water belly downwards with little apparent movement from place to place, if left undisturbed. Their food consists of smaller, aquatic invertebrates (Cladocera, etc.), and I have often observed them "browsing" in the mud-bottom of the pond or among the green algae there. In return they form an important item in the diet of certain aquatic insect larvæ (beetles, caddis-flies, etc.) or young fishes, against which they have little other protection than their transparency. Just prior to and during the time the eggs are becoming ripe the females generally carry the males around; the latter seize their mates around the genital somites dorsally with their claspers and retain their hold until the time of copulation is over. Then the males leave their "victim" for another female and repeat the process, which is perhaps a necessary procedure as there are generally far more females than males of a certain species in the same pond. When the eggs have been laid they, so far as has been observed, rise to the surface of the water and float there until hatched, or if the pond dries up or freezes to the bottom they remain (hibernate) in the mud until hatching is possible, when the pond is again filled with water or its ice melts. As a matter of fact this desiccation or freezing (hibernation) of the eggs seems to be necessary for their development (see *Ottawa Naturalist*, April, 1896, Prince).

The sudden appearance of the fairy-shrimps is truly wonderful and has long puzzled students. Outside of the arctic they are generally found only in temporary pools or ponds, being hatched there in thousands as soon as the ice in the latter melts or when they are again filled with water. In the arctic and probably in mountain-lakes (ponds) at high elevation, say about 10,000 feet, where the conditions are similar, nauplii appear (hatch) immediately after the ponds melt (June), and the animals have thus a period of 3-4 months in which to grow to maturity and deposit their eggs in case the pond they are found in does not dry up before the water freezes and all, except the hibernating eggs, are killed off by being frozen into the ice, or die a natural death. At more southern latitudes, however, and at lower elevations, the ponds in which they occur are far more likely to dry up; thus near Ottawa, Ontario, I have found the first ones in the middle of April[2], when they (*Eubranchipus gelidus*) were about 1 cm. long, thus young individuals probably hatched a couple of weeks before; the full-

[2] See also Halkett's observation. Ottawa Naturalist, July, 1895, p. 89.

grown ripe individuals collected by A. G. Huntsman near Toronto, Ontario, in June 1908, probably represent their last appearance in the summer. Young ones (3-10 mm.) were collected on April 10, 1920, near Toronto, Ontario; they therefore probably hatch earlier near Toronto than at Ottawa. Near Ottawa I have not observed them later than the month of May, and in all cases they were found only in temporary pools or canals caused by snow melting and the overflow of the Ottawa, Gatineau or Rideau Rivers in the spring. As to their occurrence in the United States I refer the reader to Packard's and Verrill's articles about them; it is sufficient here to state, that while certain species occur only in the winter and early spring, others are present both in the spring and in the fall, but not in the summer; while again others (*Artemia*) are found when the water is very warm.

According to my own field observations during a period of three years along the arctic coast of north-western America I may safely state that there is only one "brood" (generation) per year in the arctic; the same is probably true of the subarctic zone of this continent; while in southern Canada and the United States two or more broods (generations) per year may occur; though the long time during which the ponds are dried up during the summer here probably restricts the number of generations considerably.

Apart from the enemies in (insects, fishes) and outside (birds) the water a great number of fairy-shrimps (and Notostraca as well) are killed off prematurely in the summer or autumn by the drying up of (at least in the arctic) the particular small pond in which they live or by being thrown up along the margin of the particular lake by waves in windy weather, as I have repeatedly observed in the arctic parts of America and Greenland. I have also observed how a great number of phyllopods in the fall freeze into the ice as the latter begins to form and grows in thickness, though a number of individuals were living in the water right under the ice, even if there were only a few inches of free water. It will, therefore, be realized how important it is for the propagation of these animals, that they occur in such vast numbers and that the hatching of the eggs takes place almost immediately after the melting of the pond or lake-ice in the spring, or after the autumn rains (absent in the arctic) have filled the dried up reservoirs in which the eggs are lying.

The fairy shrimps on this continent are divided into two groups (super-families) according to the number of their pregenital, foliaceous body-legs. The one group (*Polyartemiidæ*) has 17 to 19 pairs of these while the other group (comprising the great majority of fairy-shrimps species) has only 11 pairs.

To the first group belong two genera, of which one (*Polyartemia*, 19 pairs of foliaceous legs) is not found in America, but a species (*P. forcipata* Fisch.), occurs in the arctic parts of Europe and Asia, both in Scandinavia and Siberia and probably also in the intervening arctic part of Russia[3]. Its biology, structure and development have been given in detail by G. O. Sars, in *Fauna Norwegiae*, 1896, pp. 59-65.

The genus found in America is *Polyartemiella*, so-called owing to its similarity to *Polyartemia*, from which it, however, is distinguished by having two pairs less of foliaceous legs. Curiously enough the genus *Polyartemiella* seems to be limited to the arctic and subarctic parts of Alaska and Yukon Territory, and thus resembles somewhat the freshwater Amphipod *Synurella*. In the same way as *S. johanseni* has its nearest relatives in Europe and Asia, so have also the two known species of *Polyartemiella* their nearest relative in the Eurasian form *Polyartemia* mentioned above. Considering their respective distribution we may perhaps assume, that both *Synurella* and *Polyartemia* have their original home in Eurasia, and have spread from there to the northwest corner of America, where then the latter genus became transformed in the course of time to the only slightly different genus *Polyartemiella*. This invasion of America took place perhaps via a former land-connection between Siberia and Alaska, a view which is supported by the fact, that one of the *Polyartemiella* species (*P. judayi*) has been found upon at least some of the islands in the Bering Sea (De Dées).

3. Recorded from Novaja Semlja (Hansen).

The males of the two *Polyartemiella* species are easily distinguished by their claspers. In one (*P. hazeni* Murdoch) the claspers are big, antler-like processes with four branches: in the other (*P. judayi*, De Dées), they are more like fish-hooks (or sickles) and three branched, thus more like those of *Polyartemia*.

The first named species, about 1 cm. long, was originally discovered by Murdoch of the International Polar Expedition in tundra pools at Point Barrow, Alaska, in the middle of July, 1882, and described and figured by him in the reports of the said expedition p. 150. A better description and figure of it has later been given by De Dées, p. 106-07, (1910); according to Pearse [4] it also occurs at other places along the arctic coasts of Alaska and Yukon Territory. It has hitherto not been found east of the Mackenzie River. During the Canadian Arctic Expedition I secured in tundra ponds at Teller (Port Clarence), Alaska, a couple of males and half a dozen females of apparently the same species in the beginning of August, 1913. They differ in various points from Murdoch's description, but a full account and figures of them will be given in the reports of the Canadian Arctic Expedition (Vol. VII, Part G.) to which I refer.

Polyartemiella judayi (about 12 mm.) was originally described by De Dées in *Annales des Sciences Naturelles*, Paris, 9th series, Vol. XI, 1910, p. 108-11, from specimens collected by Dr. Juday on the Pribilof Islands in Bering Sea. I did not myself find this species in Alaska, and as is the case with the other species (*P. hazeni*) little is known about the life history, the young stages not having been secured as yet, though both sexes are known. [5]

The genus *Polyartemiella* thus seems to be limited to the arctic and subarctic parts of northwest America, west of Mackenzie River.

To the second group of fairy-shrimps (those with 11 pairs of foliaceous legs) belong three or four families, of which only two have been recorded from Canada and one of these latter also from Alaska. The characters separating the families are not very good, because they are mainly the appendages (claspers and accessories) on the head of the ripe males, and even two species belonging to the same genus are extremely different in this respect. I, therefore, do not find it necessary to give the distinctions between the families here, beyond mentioning, that the genus *Thamnocephalus*, which occurs in the middle parts of the United States (Kansas, Colorado, etc.), is very distinct from all the other fairy-shrimps belonging to this group, by reason of the fusion of the post-genital segments and the cereopods.

Probably the most widely distributed of all fairy-shrimps is the circumpolar form *Branchinecta paludosa* O. F. Müller. It reaches a length of 2 cm., and the male claspers are fairly simple (though when the animals are ripe, well developed), consisting of a stout and long, cylindrical basal part with a row of short spines on their inner margin, and when fully developed, a little longer, more slender, triangular and falciform, apical part (joint). The protruding parts of the male genitalia are thick, arcuated and paired (bifid), while the ovisac of the female is very long, slender and thickest near its free rounded end.

This species was first described by Otto Fabricius from West Greenland as *Cancer stagnalis* (Fauna Groenlandica, p. 247, 1780), and much confusion was caused by his thinking it was the same as Linnaeus' species of the same name from Europe, and by O. F. Müller in his Zoologia Danica II, calling it *Cancer paludosus*, in the belief that it was the same genus as the species (*Branchipus stagnalis*), occurring upon the continent of Europe and first recorded by Linnaeus as *Cancer stagnalis*. It was finally established as being the circumpolar, arctic form *Branchinecta paludosa* by Verrill. It is distributed from Alaska to Greenland in the new world, and in Eurasia it has been recorded from northern Scandinavia, Spitsbergen, Novaja Semlja and Siberia. Curiously enough it has not yet been found in East Greenland. Another species (*B. gainii*) of the same genus was found by Charcot in the Antarctic.

[4] Polyartemiella hanseni (Murdoch) coll. by J. M. Jessup at Muskeg Lake, lat. 69° 40' N., long. 141° W., July 25, 1912, and at Muskeg pools on flood plain of Firth River, lat. 69°20' N., long. 141° W., June 23, 1912 (Pearse, 1913).

[5] The females are a few millimeters longer than the males.

As to the southern boundary of the distribution of *B. paludosa* on this continent little is known; but the records of it from Commander Islands, Siberia (Lilljeborg, and the Pribilofs (U.S.N.M.) indicate that it is found at least upon some (western?) of the Aleutian Islands. Also, some young ones were collected by J. M. Jessup in a puddle at Whitehorse, Yukon Territory, June 7, 1912 (Pearse, 1918). I did not observe it at Nome or Teller, Alaska, but it was found by Murdoch at Point Barrow in the same pools as *Polyartemiella hazeni*. I found it very common along the coast from Camden Bay to Demarcation Point, Alaska, and also on Herschel Island, Yukon Territory, in the summer (June-August) of 1914. It was also collected by J. M. Jessup in Muskeg Lake (lat. 69°40'N. long. 141°W) on July 25, 1912 (Pearse, 1913). We may, therefore, perhaps assume that it occurs over the whole of Alaska and the Yukon Territory, except the southern part of the former, at a certain time of the year, and where suitable ponds or lakes are present. Dr. J. Rae brought back from Cape Krusenstern, Dolphin and Union Strait, Northwest Territory, some fragments of both sexes collected in August, 1849; they were referred by W. Baird to this species. According to the great number of observations and collections of this species by me in 1914-16 in this locality (Bernard Harbour) there can hardly be any doubt about it, an opinion also expressed by Verrill and Packard. It was further secured (Sars) by the "Gjoea" Expedition (Amundsen) on the south side of King William Land, in 1904 and 1905; by the "Neptune" Expedition at Fullerton on the west side of Hudson Bay in 1903-04; by Turner in pools on rocks at Fort Chimo, Ungava; by Packard in August, 1864, and by Bryant in 1908, at Hamilton Inlet in Labrador; by the Second Norwegian Arctic Expedition on Johan Peninsula, Ellesmere Land, in 1898-99; by Hart at Discovery Bay (lat. 81°41'N.) and by the Princeton Expedition, 1899, at Cape Sabine, on the west side of Grinnell Land. In west Greenland it has furthermore been recorded from a number of places up to Polaris Bay (about lat. 82°N.), where it was taken by Bessels in August 1872, (Packard), and on Northumberland Island, (Ortman). There can therefore be little doubt that it occurs upon all the islands composing the Canadian Arctic Archipelago.

The structure and biology of this species has been so well treated and figured by G. O. Sars in his monumental work (1896) that I need only refer briefly to the life-history. The additional observations I was fortunate to make during my stay along the arctic coast of northwest America with the southern party of the Canadian Arctic Expedition 1913-16, will be found in the reports of the said expedition (Volume VII, Part G). Suffice it to say that its whole life-history is now known, because I secured in the north still earlier stages than Sars' metanauplii (see his Tab. VIII) and actually succeeded in rearing in the spring the nauplii from hibernating eggs kept all through the winter. Its life-history is, therefore, the following, at least in the arctic part of northwest America. The hibernating eggs frozen in the ice, hatch out a little after the latter melts in the spring or early summer (June), and the nauplii and metanauplii continue to grow until at the end of July or beginning of August they are sexually ripe. The copulation and laying of the eggs then takes place during August and part of September, until the water freezes and kills them all except the eggs. Apparently, however, a great number of the adults die a natural death from the middle of August on, presumably when copulation and egg-laying is over. That they are also killed off by other causes (enemies, waves, drying up of the ponds) has already been referred to. The earliest records in the year I have from this coast is Chantry Island, June 17, 1916, (a couple of nauplii and many metanauplii), and the latest record is adults of both sexes from Bernard Harbour, August 23, 1915 (specimens kept).

Mr. A. Halkett writes in his field-notes from the "Neptune" Expedition, that female phyllopods of this species (identified by Prof. G. O. Sars of Christiania, and by me) were collected in ponds at Fullerton on the west side of Hudson Bay as late as the end of October and the beginning of November, 1903. The water-depth of one of the ponds was about seven feet, and they were then all covered by ice, which in the last days of October was of a thickness of about one foot. The temperature of the air was about zero, and that

of the water around freezing-point. The water on testing showed to be slightly saline, though used for drinking-purposes.

Since my return from the expedition I received from Professor A. Willey, of McGill University, Montreal, P.Q., six adult branchipods (4 females, 2 males) which so far as I can see belong to this species. They were collected in a pond cut off from the river at Point St. Charles, near Montreal in May-June about 20 years ago. Professor Willey informs me that they have not been observed in that locality since. They were about 2 cm. long, and the females had ripe eggs in the brood-pouch. This is certainly a most extraordinary record, and quite at variance with what one should expect—to find this circumpolar form at Montreal. The species has been recorded from the Carpathians (De Dées), so it would be far more natural to expect to find it in the Rocky Mountains than in the lowlands of the St. Lawrence River. However, the shape of the male claspers, their rows of spines, the oblong ovisac of the females, etc., makes me feel confident the specimens belong to *B. paludosa*. The eggs were perhaps brought with a ship returning from Labrador or other part of the eastern arctic and then developed when the snow melted in the spring. My identification of these specimens from Montreal has been verified by Professor A. S. Pearse, of Wisconsin University (letter to me of March 29, 1920).

In Europe this species has been recorded from high altitudes in the Carpathians, but the above record from Montreal, Que., is the only instance known of its occurrence on this continent outside the arctic or sub-arctic regions.

A couple of other *Branchinecta* species are found in the middle United States, but have so far not been recorded from Canada or Alaska, and are not likely to occur here, though one of them (*B. coloradensis*) is perhaps an arctic relict form, being found only in ponds and pools on the highest mountains (above 10,000 feet) in Colorado. [6]

Nor has the interesting fairy-shrimp *Artemia salina* (*A. fertilis*, *A. gracilis*, *A. monica*), known from many parts of Europe, West Greenland and some of the States, (Connecticut, Utah, California), and in lower California, been found in Canada so far. [7] Much has been written about this species as to its sudden occurrence in salt lakes, and in railway tubs filled with brine, where it can withstand more than 270 grains of salt per litre, and where its red color increases in intensity with that of the salinity of the water. This is also the species to which the common European form *Branchipus stagnalis* (*B. ferox*) transformed by degrees when the salinity of the water in which it occurred was increased, as also the reverse occurred when the water was diluted, according to Schmankevitsch's investigations. On this continent, however, *Branchipus stagnalis* does not occur (the species mentioned in *Ottawa Naturalist*, July, 1895, and April, 1896, is almost certainly *Eubranchipus gelidus* Hay), and so far as I know the experiments referred to above have not been successful over here, though there are apparently no generally accepted characters separating the genus *Artemia* from that of *Branchinecta* or *Branchipus*.

Of the genus *Eubranchipus* half a dozen species are known on this continent, the majority of them only from the United States, though all from the northern and middle States, and none from the west. Only one species (*E. gelidus* Hay) has so far been found in Canada and Alaska, but at least some of the others may well be found to occur in the Dominion, as they are known from New England to Wisconsin south of the boundary line, and one species (*E. vernalis* Verr.) has a very wide distribution. Perhaps the most widely distributed species is *E. gelidus*, which has so far been recorded from Massachusetts, New York and Indiana in the States and from Ontario and Yukon Territory in Canada; it also occurs in Alaska. For records in Yukon Territory and Alaska see Pearse, 1913. It is extremely common around Ottawa in the spring, and occurs on the Quebec as well as on the Ontario side of the Ottawa River. There can be little doubt but that this is the species A. Halkett observed in 1893 and 1894 at New Edinburgh, Ontario, (*Ottawa Naturalist*, July,

[6] The eggs of this species are unusually large.

[7] It may occur in Southern Ontario or Quebec, judging from its presence in Connecticut.

1895). Apparently he did not preserve the specimens, but it is the only fairy-shrimp I have found occurring around here. The female especially is easily distinguished from the other species belonging to this genus, having the ninth and tenth body segments produced into lateral, triangular processes dorsally, probably serving for copulatory purposes. The ovisac is broad and elliptical and contains about a dozen ripe, yellow-brown eggs. When the animal is swimming it is continually moving from side to side, so the eggs roll around inside. The clasping antennæ of the male are somewhat claw-shaped with a short swollen basal part supplied with two medio-ventral, short spines, and a more slender and longer terminal part with bifid tip. Twice as long, however, are a pair of accessory organs at the base of these antennæ (claspers) dorsally, in the shape of broad, lobated appendages which we may suppose are used for "tickling", or twisted around the female's body during copulation. The protruding male genitalia is a bifid sack ending in two pointed appendages.

These fairy shrimps attain a size of 1¾ cm. in May-June, when they are ripe, and vary greatly in color, the females especially having much rose-orange, blue and black-brown pigmentation; but my observations regarding the colors of the many individuals I have examined are too detailed to be included here. The paired eyes are dark purple and the tips of the cercopods white; the latter color shows up very conspicuously when the animals swim in the water. Of this species I have examined specimens from the following Canadian localities.

Montreal West, P. Que., May 5, 1920, A. Willey, coll., adult male and female, the latter with eggs.

De Grassi Point, Lake Simcoe, Ont., May 10, 1915 and May 6, 1917, E. M. Walker, coll., 27 adults ,12 males, 15 females, 1-1¾ cm. long.

Scarborough Junction (Toronto), Ont., June, 1908, A. G. Huntsman, coll., 11 adults (5 males, 6 females), 1½, 1¾ cm. long (see *Natural History of Toronto Region* 1913, p. 275).

Ponds near Bond Lake, Toronto, Ont., (York County), April 10, 1920, A. G. Huntsman, coll., (young stages, 3-10 mm. long, immature).

Around Ottawa I have collected them in temporary pools or canals at various places, at Hull Park, near Fairy Lake, Deschenes and Tenaga (Gatineau River), on the Quebec side, and at various points (Billings Bridge and Hartwell Locks) along the Rideau River on the Ontario side. Around Ottawa the nauplii hatch soon after the melting of the snow and the breaking up of the rivers, and the pools they occur in are literally teeming with them. They are found in pools on open fields or pastures as well as in the woods; already at the end of April they are ½ cm. long and the females carry their light brown eggs in the sack. The smallest number I have seen in one pool is ½ dozen, which were collected on April 20, 1919. I tried to keep a dozen of them, (4 males, 9 females) alive in a jar. The next day, however, two of the females and three of the males died; before the first of May the last male and a couple of the females died, during the beginning of May the rest of the females died except one which lived until May 7th. It will thus be seen, that these animals are more hardy than is generally supposed, especially the females; no food was given them while they were kept in confinement. I observed, that one second elapsed between two succeeding turnings-over of the egg-sack from right to left, or the reverse, when the female is swimming; the movement is apparently for the purpose of bathing the enclosed eggs in the water passing in and out of the egg-sack. May or June is probably the last month in which they are present in southern Ontario and Quebec; from July on all the pools in which I have observed them earlier in the summer are dried up and the deposited eggs remain in the bottom, probably hatching the following spring.

Prof. O'Donoghue, of the University of Manitoba, tells me in a letter (June, 1920) that "a species of *Branchipus*, or more probably an *Eubranchipus*[8]) is fairly common all around Winnipeg, on both sides of the Red and Assiniboine Rivers, as a rule

[8] Probably E. Gelidus. (F. J.)

in the pools formed where the snow melts..."

On June 1, 1920 Dr. A. G. Huntsman, of Toronto, collected twelve specimens of *Eubranchipus gelidus* in shallow sloughs near Wetaskiwin, Alberta (near Edmonton). One of these is an adult male, the others are females, mostly adults, and with ripe eggs.

Together with the *Streptocephalus coloradensis* (see below) these are the first records of fairy-shrimps from western Canada.

On the Canadian Arctic Expedition I found in a large shallow pond on top of a ridge at Bernard Harbour, N.W.T., a number of fairy shrimps (both sexes) of a peculiar species, (*Artemiopsis Stefanssonii*) not known before. Another species (*A. bungei* Sars) is known from Siberia and the New Siberian Islands. The new species will be described and figured in detail in the reports from the said expedition (Vol. VII, Part G), so I need only give a summary of my observations on it here. I first observed it on October 6, 1915, in a one foot deep pond which then had seven inches of ice covering it, but in spite of this the fairy shrimps were very active. In size they were from seven to eleven mm. long, the females being generally a little longer than the males, but all were apparently adult and ripe. They belong to the group of fairy shrimps with eleven pairs of progenital limbs, and the male had its claspers in the form of powerful, sickle-shaped, terminal parts (with two spines projecting some distances from their tips), projecting from a swollen basal part, besides somewhat spiral shaped protruding genital organs, while the female had a very large elliptical egg-sack with olive-brown eggs and a couple of curved processes projecting laterally from the dorsal side of the genital segments. Especially do these female characters remind one decidedly of *Embranchipus gelidus*, but the shape of the male claspers and genitalia, together with the absence of accessory copulatory organs (frontal processes, etc.), distinguish them at a glance. In color the males were paler than the females, the latter were orange-red-brown and transparent posteriorly. When found these fairy shrimps were mostly *in coitu*, the males holding the females by their claspers dorsally just above the egg-sack and aiding them in locomotion.[9] Males not in copula would soon attack one of the females, which were present in larger numbers than the males, and remain with her as long as copulation lasted. I kept these fairy shrimps alive for some days in a jar, but finally they all died, nor did I have any success in trying to rear the eggs during the winter and next spring. What is apparently the matanauplii (2-3mm.) of this species I found next summer (July 3, 1916) in the same pond; at that date the *Branchinecta paludosa* metanauplii were considerably larger, so apparently the new species is somewhat later (a couple of weeks) in its development (hatching). On the other hand it lasts longer in the fall, no *Branchinecta* being met with after the freshwater freezes in September on this coast, while the other fairy shrimp, as mentioned, was secured as late as the end of the first week of October. Owing to the shallowness of the pond, however, they probably would not live many days longer, but be killed off when the water froze to the bottom before the middle of the month. I only found the new species in the pond mentioned, and the locality (Bernard Harbour) is the only one in which it has been met with so far. In this connection it is interesting to note that De Dées (1910) says in his account of the Siberian species (*A. bungei*) of the same genus, that it apparently can withstand a very cold water (about 1° Réamur), and at least some of the specimens were secured on October 10 (1886). This conforms remarkably well with my observations on the new Canadian arctic species (*A. Stefanssonii.*)

Dr. A. G. Huntsman of Toronto has recently sent me four adult (about 2½ cm. long) fairy-shrimps, one female, the rest males, which he collected on June 11, 1920, in shallow sloughs, three miles northeast of Medicine Hat, Alta. I have identified them as *Streptocephalus coloradensis* Dodds, and Prof. A. S. Pearse of the University of Wisconsin has verified my determination of this as of other uncommon Canadian Phyllopods. These *Streptocephalus* occurred together with *Lepidurus couesii*,

[9] Though the principal swimming was done by the female.

and the two "clam-shrimps", *Estheria mexicana* and *Limnetis gouldii*. The female had ripe eggs in its long, tapering [10] ovisac, and the three males had the copulatory organs well developed. This is the first record of this family in Canada; it is known in the United States only from Colorado, from which state it was originally described and figured by Dodds in 1916. The family (and genus) is characterized by the male having very long, tortuous and three-jointed claspers (second antennæ), with particularly the terminal joint subdivided into branches and appendages (see figure by Cockerell, 1912). The male has the protruding genitalia rather small and slender; while with the female the second pair of antennæ hardly exceeds the first pair in length.

This new Canadian record makes it very probable that the species also occurs in Wyoming and Montana. In Colorado it occurs, according to Dodds (Proc. U. S. N. M. Vol. 49), on the eastern slope of the Rocky Mountains (Eldorado and Fort Collins), up to an elevation of almost 9,000 feet. The new record at Medicine Hat (which lies at an elevation of about 2,135 feet) apparently gives the lowest known altitude of the occurrence of the species.

(*To be concluded.*)

[10] Thus distinguished from the female B. paludosa.

SOME NOTES ON THE BELTED KINGFISHER.

BY PROF. WILLIAM ROWAN, UNIVERSITY OF ALBERTA, EDMONTON.

The following notes were obtained at the new Biological Station of the Manitoba University on the shores of Indian Bay, Shoal Lake, Lake of the Woods, Man., between the 15th of June and the 4th of August 1920. The Biological Station is placed in the wildest scenery right on the shores of the bay, 100 miles east of Winnipeg. Most of the intervening country is muskeg and little of it is settled. The University buildings consist of two bungalows, and there are half a dozen other buildings inhabited by employees of the Greater Winnipeg Water District and hands connected with the little private railway which supplies them with food and weekly mail bag. The birds were therefore studied in a comparatively undisturbed and natural environment.

The shores of the lake are entirely rocky and thickly clothed with trees, mainly poplars. The scores of islands in Shoal Lake are similarly of solid rock, covered with extremely dense vegetation. On our arrival the nesting sites of the Kingfisher, one of the most abundant birds, was a problem, for even his colossal beak is useless when it comes to working in rock. No amount of searching or watching from the canoe along the banks revealed a single nesting hole. The continual passage, however, of Kingfishers from the shores of the lake to the banks of a large gravel pit —a relic of the water works operations— put us on the right track and on the third day we had found the first nest. The holes are so characteristic that, having found one, others were easy, and a half hour's search revealed nearly a dozen nests in the two banks. The pit is about a quarter of a mile in length and some hundred yards across and the banks are mainly of soft sand. The only other birds nesting in holes here are Rough-Winged Swallows, and of these there is but one small colony with their little holes characteristically close to one another. The Kingfisher's holes are much larger, being six or seven inches across, and all are at the tops of the banks. Some are old, others in use. The latter can immediately be detected by the curious double track of the two feet of the parents worn into the soft sand and running from the entrance inwards. There is no offensive smell however, and no filth oozing out, two characteristics of some other species of Kingfisher. The burrow is as a rule between two and three feet in length, horizontal and straight. The terminal chamber is very roomy, as indeed it must be to hold the seven or eight large young. It is invariably sunk beneath the level of the run, and if dug out is found to have the wall dripping and reeking with filth. The young, when ready to fly, have an extremely offensive smell, their breast and belly feathers being plastered together with caked sand.

One or two exceptions to the straight run were found in cases where the birds had struck a large root far in while burrowing. If this should happen early in the proceedings the hole is apparently abandoned. Small roots are broken and cleared out. No fish bones were found in any of the chambers examined.

This sand pit, a quarter of a mile from the lake, was the favourite nesting ground. One or two burrows were found in the soft humus and leaf mould covering the islands, but these were all comparatively short. In one case there were no less than three attempted and abandoned holes round the successful one, either big roots or rock having formed an impassible barrier. Other nests were found in small sand pits dug in various parts of the forest. Some of these were a mile from the lake and measured but a few yards across with the banks only 18 inches high. Nearly all held a single Kingfisher family and each had one or two holes used in previous years.

Most of the eggs had hatched by the time of our arrival. A full clutch appears to consist of eight, the average size being 3.43 x 2.64 centimetres. It is hard to tell one end from the other.

The fledging period is very long, probably more than five weeks. The young are blind when first hatched and remain so for at least a week. At about a fortnight they are bristling with quills, which, during the third week, almost simultaneously "burst into bloom". A family of seven was photographed at the end of about the fourth week. A week later they left the nest one by one, two days elapsing between the departure of the first and the last. They were escorted almost at once to the lake. During the second week of July the lake's edge was alive with single young, scattered here and there, sitting stupidly by themselves or chasing a parent for food. A week later each family was reuniting and the young beginning to fish for themselves. I have seen four young and an adult on a single perch, the young presumably taking fishing lessons.

In the nest the young "churr" when hungry. This resembles the adult rattle, except that it is very much faster and on a minute scale. The young can produce the adult edition at an early age if taken from the nest and sufficiently aroused. As with the British Kingfisher, the hind toe is kept tightly pressed against the back of the leg during the fledging period. The legs are flesh coloured.

The Belted Kingfisher is a decidedly noisy bird. No matter whether disturbed by human beings, other mammals or the larger raptors it always rattles loud and long. When the young have just left the nest and are being taught their trade, the old birds are at their noisiest. At the nest there are always one or two favourite perches on which the birds may settle before going to the hole. These are usually at the top of some tall tree. Nearly always the bird lands there to the accompaniment of a loud tattoo, whether there is danger in sight or not. Their attitudes in perching vary of course, but I should say the most characteristic is with the tail, which is often flicked up, held level, and the ragged crest partially erect. This ornament always looks patchy when raised. It is thicker, or seemingly so in the young, the feathers being shorter and stouter. The adult plumages are too well known to need description. The juvenile female has the flanks more freely sprinkled with brown then the young male. Both have the grey chest band tipped with brown. Some of the young males show decided indications of the brown lower chest band of the female, but this is a variable feature. The percentage of males per brood appears to be considerably higher than females.

The food consists mainly of fish, though crayfish, abundant in the shallow edges, are extensively eaten and are also fed to the young. They are taken whole to the nest. Fish, if big, are held in the middle and slapped on a branch till dead or stunned. Fishing is mainly done after the manner of Terns, the Kingfishers hovering in the air and then diving; but they also commonly dive from perches, though I have only seen crayfish obtained in this way. Owing to the rocky nature of the lake's edge, suitable perches are few, and these are in continual use. Both birds hunt for the young (and I believe take turns at incubation), and I have seen the cock bring food for the hen when she was brooding the newly hatched young.

Photographing the birds entering and leaving the nest was attempted but with scant success owing to the disappointing qualities of the only so-called fast plates available when we left Winnipeg. Despite the most brilliant sunshine a bird photographer could wish for, an exposure of 1/10th second at an aperture of F6 was the shortest possible to get a decently exposed negative. The movements of the bird were far too quick for such a time exposure. The heat of the little sandpit in the full glare of the July sun (shade temperature 90deg. odd) was almost unbearable, perspiration dripping steadily off every inch of one's body during the whole of the time in the blind. Ants were countless, a hearty biting variety; "bulldogs" and other flies took each their ounce of flesh at frequent intervals; mosquitoes in their batallions bit through shirt and trousers alike, yet movement was impossible. The birds proved good subjects, both male and female bringing food to the half-grown young at regular intervals of about half an hour, but owing to the poor plates the camera was given up in disgust and most of the three or four days spent in the hide were devoted to observation and sketching.

THE KING versus RUSSEL C. CLARK.

This case has attracted such wide attention among naturalists, sportsmen, and all who are interested in the conservation of the Wild Life of the continent that a summary of it is not out of place here. If any reader desires the full text of the decision it may be obtained from the Commissioner, Canadian National Parks Branch, Ottawa.

On March 31, 1920, Russell C. Clark was apprehended near Mount Stewart, P.E.I., by P. G. Rowe, a migratory Bird Warden. At the time Mr. Clark had in his possession a boat, a shot-gun, and fourteen Canada Geese. He was tried before a local magistrate and the case dismissed.

Then the case came before the Supreme Court of Prince Edward Island on an appeal from the dismissal.

It was suggested by the defence that the Migratory Birds Convention Act was ultra vires the Federal Legislature as regards birds found in the province of Prince Edward Island, they being the property of the Province, and the question being raised was considered.

The judgment of the court states in part that this Act was passed to give effect to a Treaty for the Protection of Migratory Birds which traverse Canada and the United States, the title whereof is not considered vested in any particular part of either country.

The Treaty determines certain close seasons and it is by it agreed that appropriate legislation for insuring its execution should be enacted by the law-making bodies of the High Contracting Powers. This has been done by the Federal Parliament in the Act of 7, 8, George V, thus performing an obligation of this Dominion arising under a Treaty between the Empire and a foreign power.

Under the British North America Act, 1867, the Parliament of Canada is given exclusive power to make laws in this respect.

It is pointed out in the judgment that similar legislation has been enacted by an Act of Congress of the United States of America, and in the case the State of Missouri, Appellant, and Ray P. Holland, United States Game Warden, the Supreme Court of the United States held that the Migratory Birds named in the Act were only transitorily within any State, having no permanent habitat therein, and that they could be protected by national action in concert with that of another power.

The judgment goes on to state that the Canada Goose is indisputably a migratory bird traversing the Continent of America from the frozen North to the Gulf of Mexico and that it is only at certain seasons to be found in any particular part thereof.

Uniform protection for such birds is not possible for any Provincial Legislature although the killing and sale of such birds as between the Province and its people may be regulated by the Provincial Legislature. Uniform protection for these birds can only be accomplished "by national action in concert with another power" and here the Supreme Court of Prince Edward

Island quotes from the decision of the Supreme Court of the United States.

The decision is summed up with a statement to the effect that the Migratory Birds Convention Act is intra vires of the Dominion Parliament under the general power of the Federal Parliament to make laws for the order and good government of Canada as well as under its power to carry out Treaty obligations by legislation and any conflicting Provincial Legislation is abrogated by it.

The magistrate's order for dismissal was set aside and the appeal allowed with costs. Under this decision Mr. Clark's gun was forfeited, a fine of $10.00 imposed, and he had to pay the court costs.

It will be of interest to those concerned in the protection of the birds of the Continent to learn from this decision that the Federal Legislation for bird protection in Canada is legally sound.

NOTES AND OBSERVATIONS.

Animal Behavior as a Factor in the Formation of Bone Beds.

The occurrence of fossil vertebrates massed together in considerable numbers in restricted areas is a familiar fact to experienced collectors. These aggregations are usually spoken of as bone beds or quarries by collectors of fossils. Various theories have been proposed to account for the surprising abundance of vertebrate remains in certain quarries and their absence or scarcity outside these limited areas. Different kinds of bone beds evidently require different explanations.

In the case of bone beds in which only a single species or closely associated species are present, the accumulation of the remains of numerous individuals may be explained by the peculiar behavior of some animals of the present time on the approach of death from starvation or freezing. Such bone beds appear to be common in the Cretaceous. Mr. C. M. Sternberg is acquainted with "no less than 7 bone beds in which only horned dinosaurs are represented."[1]

Darwin has described the curious instinct of the guanaco of South America which leads it to "have favorite spots for lying down to die. On the banks of the St. Cruz in certain circumscribed spaces which were generally bushy and all near the river the ground was actually white with bones."[2]

A western correspondent, Mr. R. A. Brooks, has given me in a letter a description of the behavior of cattle and buffalo on the western plains under the stress of cold, starvation and fright, which clearly indicates how large masses of the bones of these animals have been accumulated. Mr. Brooks states that: "During the hard winter of 1906-07 thousands of head of cattle perished from starvation and cold. I remember well how some of them died. The first cow to die usually felt it coming and left the bunch or herd and slowly made its way to a lonely place, generally a clump of brush or a coulée, and lying down simply waited to die. The next one feeling her time approaching followed in the tracks of the first one, and died close beside her and this was kept up until there were no more, or relief came. At the U Ranch in the Hands-Hills, central Alberta, the owner showed me a coulée where 450 head of his cattle died. This pile of bones actually made a dam across the ravine. Within half a mile was another pile of bones, all that was left of 675 head. Everyone acted the same way. The owners told me that hardly half a dozen died separately and these were on their way to the dying place.

"There is also another place on the Beaver Dam river where countless buffalo died of thirst during a dry year. An old Indian told me that long ago there had been nearly three years of rainless seasons. All the rivers were dry as well as most of the springs. But one kept flowing very freely on the banks of the Beaver Dam. When a herd of

[1] E. M. Kindle, Inequalities of Sedimentation, Jour. of Geol., Vol. 27, p. 359, 1919.

[2] Chas. Darwin, The Voyage of the Beagle, p. 172.

buffalo would come near enough to scent this, there was a stampede for it and the ones behind would literally climb over the front ones and trample each other to death. Prairie fires also were the cause of many buffalo bones at the bottom of cliffs, and it is well known here that in the early days the Indians themselves used to stampede herds of buffalo over the cliffs."

This account of the behavior of western cattle under the conditions described, and the mass destruction of the buffalo when acting under stampede excitement, gives an insight into phases of animal behavior which may have been a factor in the formation of some fossil bone beds. It may be that the Alberta dinosaurs of Cretaceous times when famine came, like the Alberta cattle of today, sought a common dying ground.

E. M. KINDLE.

VESPULA DIABOLICA.—During the past summer (1920) *Vespula diabolica* was extremely abundant in northern Frontenac County, Ontario. In August and September there were hundreds of this species about my camp at Lake Missanag, where during the last four years only a few individuals had been present. Anything sweet which was exposed even for a few minutes became a rendez-vous for these wasps and was soon a mass of buzzing black and yellow. In the woods they were everywhere in evidence. From various sources I have heard of the great abundance of "hornets" in the northern districts of Ontario during the past summer, and in all probability these reports refer to the present species.

The statements in the literature concerning the nest of this species are conflicting. According to Ashmead it nests in stumps. Lutz, after describing the nests of *Vespa crabro* and *Vespula maculata*, says: "The remainder of our species, the Yellow-jackets, usually make smaller nests and place them either near or under the ground." Plate 3 in "The Hymenoptera of Connecticut" shows a small paper nest of this species apparently attached to a beam. I came across several nests of this species and all were suspended from the limbs of trees; they are large paper structures, and seem to be almost identical with those of *Vespula maculata*.

The larvae are 12 mm. long and 5 mm. in diameter at the widest part, whitish in colour, and hang head downwards, suspended by the sticky disc at the posterior end of the body. The pupae at first are white, with black eyes; later the thorax becomes dark, and the black bands appear on the abdominal segments before the wings have developed beyond the wing-pad stage.

Vespula diabolica exhibits a considerable variation in size and marking. Different individuals range from 13 to 16 mm. in length. In some individuals the black bands on the anterior portion of the abdominal segments are very wide, in others they are comparatively narrow. In some the black point on the first abdominal segment projects much further back than in others, sometimes almost cutting the yellow posterior border of that segment in two. I found such a difference in respect to marking that I sent three specimens to Dr. L. O. Howard for confirmation of identification. Dr. Howard reports that Mr. Rohwer determines them all as *V. diabolica*. Two of these specimens were taken from the same nest.

This species appears to feed very largely, if not entirely, upon vegetable substances. Sweetish sap of any kind is taken with avidity. Fruits are bitten into and the pulp devoured or carried off. Kernels of corn in the late milk stage are cut into and pieces about a millimetre square are carried off. The material carried off is probably food for the larvae, although I was not able to prove this point conclusively.

Vespula diabolica does not merit its specific name by reason of its disposition, since it is not at all pugnacious as far as man is concerned. Unlike some of the other Vespoidea no amount of striking at it seems to arouse its ire, and one individual crawled up my sleeve and came out at the neck of my shirt without stinging. In fact only if seized or crushed does it sting. Its sting is not particularly severe, the burning sensation soon passing off and leaving an itching which persists for a couple of days. It is capable of stinging twice in rapid succession. They are rather quarrelsome among themselves, and when

many individuals are taking food from a common source they have frequent combats, two individuals grappling, rolling over and over, and using their mandibles but never their stings.

This species finds its food by the sense of smell, as was shown by a few experiments which I performed. Food hidden from its sight was readily discovered, but similarly-coloured objects without odour were not visited.

A. Brooker Klugh.

A Gull in Niagara Rapids.—On the afternoon of February 16, 1921, at Niagara Falls, Ontario, I was watching through binoculars (x3) Herring Gulls, (*Larus argentatus,* Pont.) and Ring-billed Gulls (*Larus delawarensis* Ord.) which were picking bits of food out of the rapids of the Niagara River. So skilfully did they do their work that they seemed to receive on their plumage not even a drop of spray as they dipped repeatedly to the surface of the rough water. But one adult Gull, of which species I cannot say, must have made an error as he sought to obtain some object in the rapids just above the brink of the Canadian Falls, for, while I watched with my glasses focussed on him, he was suddenly seized by the foaming river, and in a flash he disappeared beneath the surface. I concluded that his career was ended and that in a few moments more he would go over the falls. Hardly had I had time for the thought, however, when, several feet down-stream from the place where he had been submerged, the Gull reappeared and succeeded in taking flight. Apparently the rough handling which he must have received while beneath the surface of the rapids had forced water into his usually water-proof plumage, for, as he flew slowly away, he was seen to shake himself vigorously, as a dog will do on coming out of the water.

Harrison F. Lewis.

The Greater Snow Goose.—Most recent writers on the water-fowl of north-eastern North America speak of the Greater Show Goose (*Chen hyperboreus nivalis* (Forst.)) as a rare bird in that area and appear to pay little or no attention to the fact that Mr. C. E. Dionne, on pages 109-110 of his book, "Les Oiseaux de la Province de Québec" (1906), states of this subspecies that it "is very common and often occurs in considerable flocks in spring and fall in certain places on our shores, notably at St. Joachim, where I have seen flocks of three or four thousand individuals, on the Island of Orleans, and as far as the Sea-Wolves' Batture". The three points mentioned by Mr. Dionne are within sight of one another. In their vicinity probably all the Greater Snow Geese in existence in a wild state gather each spring and autumn. From the independent statements of various careful observers, I should conclude that their number is now about five or six thousand. When I visited St. Joachim on March 31, 1921, I saw about two thousand Greater Snow Goose there and was told that the maximum number would be present about ten days later. They are well protected by a resident warden maintained by the Cap Tourmente Fish and Game Club.

Harrison F. Lewis.

The Town of Yarmouth, N.S., Buys a Bird Sanctuary.

The municipality of the Town of Yarmouth has purchased a Bird Sanctuary. This was not an area suitable for a park or other similar purposes,but was the Island in Lake George where the colony of Great Black-backed Gulls nest. It is of use for Bird Sanctuary purposes only, and this colony of Gulls, so ably described by Mr. Harrison F. Lewis, will now be protected, and will serve as an additional attraction for bird-lovers in the Yarmouth vicinity.

The publication of Mr. Lewis'[1] article in the "Naturalist" assisted in crystallizing local public opinion on this question for it was extensively quoted in the Yarmouth press at the time that the matter was under consideration.

The only step necessary to complete the Sanctuary will be the formal setting aside of the area by the provincial authorities.

Large cities have parks where land birds find refuge and may be studied by the student; these are bird sanctuaries with-

[1] Canadian Field-Naturalist Sept. 1920.

out doubt; but the town of Yarmouth has pointed the way to other Canadian municipalities by purchasing an area solely because the birds found it suitable. What a splendid impetus would be given to bird protection if every town that had such a bird colony near it were to extend its influence officially in the interest of its bird neighbours. In the West the care of a prairie slough suitable for wild fowl as the town bird sanctuary would be a worthy line of endeavour for any town or city. The idea could be combined with the present laudable desire of many municipalities in the Western Provinces to reserve park lands in their immediate vicinity.

HOYES LLOYD.

FRESHWATER CRUSTACEA FROM CANADA. — Since writing my articles on this subject (see *Can. Field-Naturalist*, October and November, 1920) I have had the opportunity of examining some samples of freshwater invertebrates collected by Dr. A. G. Huntsman in southern New Brunswick and Nova Scotia in the fall of 1920. They contained the following new records of Amphipods and Isopods:—

Hyalella knickerbockeri, Bate (*H. Azteka* Sauss): Several young ones from Lock Lomond, near St. John, N.B., October 7, 1920, and from Solomon Lake, near Yarmouth, N.S., October 4, 1920. *Asellus communis*, Say: Several young ones from Solomon Lake, N.S., October 4, 1920.

FRITS JOHANSEN.

BOOK REVIEWS.

THE AUK, No. 3, JULY, 1920.

Notes on Some American Ducks, by Allan Brooks, 2 plates, pp. 353-367.

Ornithologists are not as a rule sportsmen, and undoubtedly their greatest weakness is a lack of personal familiarity with water-fowl. The difficulty of obtaining material for the study of these birds at the most interesting and illuminating time of the year (the close season) is somewhat to blame for this, but the feeling that birds so systematically hunted must already be well known has tended to turn the attention of ornithologists towards fields that seem to present greater promise. The fact is, however, that the very few sportsmen and shooters, who know any more about ducks than is sufficient to make occasional bags at certain seasons of the year, are seldom fitted either by scientific training or inclination to present their observations in a proper manner. While many old hunters are mines of valuable information, and our sporting magazines are filled with more or less accurate accounts of the habits and characters of wild fowl, but little of scientific worth has been made public from these sources in America and it takes the closest discrimination to separate that little from the fiction in which it is buried.

This paper is therefore of great value as it comes from a man who knows his subject from both the sportsman's and the naturalist's standpoint. It consists of various notes on nine species of British Columbian ducks. They are too varied to be more than mentioned here, except a detailed analysis of the difference between the American and Barrow's Golden-eye which is treated at length, with plates showing courtship attitudes of the latter. It is a coincidence that the author calls attention to the differential features of bill and wind-pipe that the present reviewer discussed in a late number of this journal. Courtship in Birds, by Chs. W. Townsend, pp. 380-393.

This is a philosophic study of the strange courtship dances and actions that are indulged in by many birds. The author has made a special study of these and no one is better qualified to generalize upon them.

Ontario Bird Notes, by J. H. Fleming and Hoyes Lloyd, pp. 429-439.

A résumé of the ornithological developments in Ontario since the publication of Fleming's Birds of Toronto, *Auk*, XXIII and XXIV, (1906-1907). It includes notes on some 71 species.

Seventeenth Supplement to the American Ornithologist's Union Check List of North American Birds, by the Committee on Nomenclature, consisting of Witmer Stone, H. C. Oberholser, Jonathan Dwight, T. S. Palmer and Chas. W. Richmond, pp. 439-449.

When the last Check-list was published in 1910 it was proposed to issue revised

editions every decade, leaving the subject of changes to rest from official action in the interim. This would give us ten year intervals of approximate stability instead of a constant and progressive series of change. 1920 was the year for the accumulated proposals of change to be considered and decided upon and a new Check-list published. However, one of the important matters under consideration at the 1919 annual meeting was the proposal from the British Ornithologist's Union that the two associations should unite in a check-list of birds of the world in which we were to assume charge of the part covering America.

It was recognized that, however desirable this might be, it brought to the fore the fundamental differences between European and American practice, but it was hoped that grounds of agreement could be arrived at. Harmonizing of opposed views and the mutual concessions necessary to agreement is a difficult matter, and though the publication of a check-list has been held up, that object of the negotiations has not yet been arrived at. The committee on Nomenclature has been busy, however, and has decided that the results of their findings should no longer be withheld. Considering that this supplement is "a considerable part" of ten years accumulations it is not as bad as the annual installments of possibilities led us to fear. The additions and changes number 32, the rejections 35. Those affecting the names of Canadian birds are as follows:

GENERIC CHANGES.

Megalestris Bonaparte, Skut, becomes *Catharacta* Brunnich.

Hydrocheledon Boie, Black Tern, becomes *Chlidonias* Rafinesque.

Thalassidroma Vigors, Storm Petrel, becomes *Hydrobates* Boie.

Aestrelata Bonaparte, Petrels, becomes *Pterodroma* Bonaparte.

Clangula Oken, Goldeneye, becomes *Glaucionetta* Bonaparte.

Herelda Stephens, Harlequin, becomes *Clangula* Leach.

Macrorhamphus Forster, Dowitcher, becomes *Limnodromus* Wied.

Calidris Illiger, Sanderling, becomes *Crocethia* Billberg.

Helodromas Kaup, Solitary Sandpiper, becomes *Tringa* Linnaeus.

Heteractitis Stejneger, Wandering Tatler, becomes *Heteroscelus* Baird.

Charadrius Linneaeus, Golden Plovers, becomes *Pluvialis* Brisson.

Aegialitis Boie, Ring Plovers, becomes *Charadrius* Linnaeus.

Cathartista Vieillot, Black Vulture, becomes *Coragyps* Geoffroy.

Aluco Fleming, Barn Owls, becomes *Tyto* Billberg.

Saxicola Bechstein, Wheatears, becomes *Oenanthe* Vieillot.

The Gannet, *Sula Bassana* (Linnaeus), is placed in another genus and becomes *Moris bassana* (Linnaeus).

SPECIFIC AND SUBSPECIFIC CHANGES.

Calidris leucophaea Pallas, Sanderling, becomes *Crocethia alba* Pallas.

Vermivora rubricapilla Wilson, ashville Warbler, becomes *Vermivora rufica-pilla* Wilson.

Compsothlypis americana usnea Brewster, Northern Parula Warbler, becomes *Compsothlypis americana pusilla* Wilson.

It is evident from this that many of our oldest and most familiar names have gone into synonomy but it is also to be noted that the Committee have dropped diphthongs in the spelling which is an advance in the direction of simplicity and a relief to the printer who is without an unlimited font.

A list of 35 rejections follows, which many of us may wish twice as long.

Under "General Notes."

B. H. Swales, p. 463, records a Hooded Warbler seen on Belle Isle in the Detroit River, Mich., May 6, 1920. This is only a fraction of a mile from the Canadian boundary and the record is of interest in connection with our few records of the species in south-western Ontario.

Harrison F. Lewis, pp. 464-465, gives a very circumstantial account of a Blue-gray Gnatcatcher seen at Quebec City, May 18, 1920. There is another old but poorly substantiated record for this species at Montreal. Mr. Lewis' description of its characteristic tail twitching and repeated hoarse note is very convincing and places the occurrence on as firm a basis as is possible for a sight record of so unusual an event.

Under "Recent Literature" is reviewed, pp. 479-480, On the Nest and Eggs of the Common Tern (*S. fluviatilis*), A Comparative Study, by Wm. Rowan, E. Wolf and P. L. Sulman, assisted by Messrs. Pearson, Isaacs, Elderton and Tildsley. *Biometrika*, Vol. XII, 1919, pp. 308-354, 5 plates.

This is a mathematical correlation of the exceedingly variable characters of the eggs and nests of this species with their environment, to detect the relation if any between these apparently hap-hazard factors. In the course of the work many hundred eggs were examined and measured and compared with their immediate surroundings. While results are not conclusive on any one point they are suggestive of lines of future investigation. Thus, whilst there was more uniformity, the eggs averaged larger inthe good season of 1914 than in the poor one of 1913. This may possibly have been due to the stricter elimination of the weaker birds or those that departed farthest from the optimum type the previous year. Another point brought out, but the meaning of which does not seem clear, was that the most spherical eggs were found in the most carelessly built nests. Much other food for thought is suggested that we have not space to mention. This is work that may well be carried on by those few who are favorably situated to examine large rookeries of variable species. The results, even if negative, are worth while, for it is as much a part of scientific pathfinding to locate the blind alleys as to mark the highway. In reply to criticism that has already been raised it may be remarked that the senior author has informed us that apart from the momentary and unavoidable fright caused by the intrusion of the investigators the birds were not disturbed and the great array of tabulated data was gathered without the necessary loss of an egg.

Under "Correspondence".

W. E. Saunders and J. H. Fleming address a letter to the Editor, proposing that in future, at the Annual Metings of the A. O. U., each member shall pay for his or her own luncheons instead of being entertained as guests by members of local organizations. It was felt that, however hospitable and willing these organizations have been in the past, it is throwing an annually increasing burden upon them that is greater than should be accepted. It may be remarked that this was followed by a circular letter to the membership, and, as a result, at the late Washington meeting the suggestion was acted upon.

Pp. 499-505 are taken up with a discussion on Popular Nomenclature, originating independently with Wm. Rowan and Harrison F. Lewis, and replied to by the Editor, Witmer Stone.

Mr. Rowan objects to the use of names like Robin and Sparrow Hawk to American species when the terms are preoccupied by entirely different Old World forms. He suggests that we return to the system in force before the 1910 Check List of prefixing the adjective American to them.

Mr. Lewis presents five propositions for the making of popular bird names:

1.—Provide for specific as well as subspecific names.

2.—Avoidance of clumsy names.

3.—Changing inappropriate or misleading names.

4.—Avoidance of the names of people in name construction.

5.—The use of modifiers to group names when used for individual members of such group.

Mr. Stone, whilst dealing sympathetically with most of these views, proclaims the impossibility of applying a "code" to the construction of popular names, fearing the introduction of "book names" and citing cases where such have failed of general adoption. In the spirit of Thompson Seton's apt phrase "the genius of the language" he objects to Rowan's proposal declaring in substance that to Americans *Planesticus migratorius* is the Robin and no other name will be generally adopted. He does, however, approve of Lewis' fifth proposition.

Whilst a hard and fast code such as is applied to scientific names (and incidentally keeps shuffling our names about) may not seem advisable and considerable latitude must be given to established popular usage, it does seem that some such principles might well be kept in mind. The Check-list is now a mass of "book names" of the bookiest kind, and it does not seem that it would put any great inconvenience upon the general public were the most ob-

surd of them replaced by others of more popular appeal. Names well established in popular usage need not be disturbed, but it does not seem likely that (1) calling the first described subspecies of the Palm Warbler, the Interior Palm Warbler; (2) shortening Arctic Three-toed Woodpecker to Arctic Woodpecker; (3) changing Arctic Towhee to Northern Towhee; (4) Brunnich's Murre to Thick-billed Murre; (5) and Chickadee to Black-capped Chickadee would arouse any general protest from the public.

It is difficult to understand Mr. Stone's attitude in regard to the prefix American to Robin, Sparrow Hawk, Redstart and others. Of course to those who know and love him *Planesticus migratorius* will always be regarded as *the robin* in spite of check lists and committees to the contrary, but colloquial use need not debar the creation of a more formal title for mixed audiences. If we speak of a certain well-known ornithologist in public or where confusion of identity might arise we are careful to use his full formal name, e.g. Dr. Witmer Stone, and on proper occasion may add a string of letters in due form. In general private discussion, I fear that the single name "Stone" is often used, whilst among his intimates I think I have heard the simple "Witmer" repeated and a nick-name may even be surmised. Yet all these forms are without prejudice to the full formal title in the check-list of American men of scinee. There is no reason why the same would not prove true of the American Robin or any other similar bird.

The fact is that *Planesticus migratorius* is not, nor ever can be, The Robin any more than it can be an elephant or any thing else that it is not. Calling it so colloquially or as a figure of speech may be convenient and expressive where the use is plain, but it is not suitable for formal occasions or where the purpose is obscure. It may be said that it is the bird called Robin in America or the American Robin, but it is not *the* Robin any more than the Canada Goose is a Bustard because French Canadians call it Outard. These are questions of fact that cannot be set aside by specialist committees. The suggestion that if *Planesticus migratorius* is the American Robin, *Erithocus rubecula* is the European Robin is hardly logical, as we can hardly call on Europe to quality itself when it has the acknowledged priority; the onus of distinction lies with us.

Finally I would take exception to Mr. Stone's proposal that the names of subspecifically divided species be made plural, as *Melospiza melodia*, the Song Sparrows. This is a retrograde step. A tree is a tree no matter how many branches it has, and *Melospiza melodia* is a species, no matter how many subspecies may be found within its limits. It is not a complex of individual disconnected units but an individual unit itself, more or less branched and containing plans of possible future cleavage; but until that cleavage occurs an individual entity for all that. To declare otherwise is to support a false and obsolete doctrine without in any way clarifying popular concepts.

Notes and News contains, p. 511, the obituary notice for Dr. C. Gordon Hewitt, who died at Ottawa, Feb. 29, 1920.

No. 4, October, 1920.

Limicoline Voices, by J. T. Nichols, pp. 519-540.

This is an interesting paper dealing with the voices and call notes of the waders, the occasions of their use and probable meanings. It is largely philosophical in tone but no one interested in these birds in life should neglect studying it.

In The Haunts of Carn's Warbler, by C. W. Eifrig, pp. 551-558.

This paper, by one formerly closely associated with the *Ottawa Naturalist*, is a general account of the birds in south-western Maryland in 1918.

Pattern Development in Teal, by Glover M. Allen, pp. 258-264.

This paper was suggested by Kennard's description of the Southern Blue Winged Teal, (*Auk*, 1913). It is the presentation of a new theory of color placement based upon the above species. The author postulates certain superficial areas or centers from which color may spread. White is normally found only at the edges of these areas and is to be regarded morphologically as caused by restriction of color development, a passive rather than an active factor in pattern development.

Migration and Physical Proportions, a Preliminary Study, by C. K. Averill, pp. 572-579.

This is an application of mathematics to ornithological study, and is based upon series of measurements of various birds correlated with their migrational and flight habits. Birds of longest migration seem to have long wings, short tails and small bills and feet. The forked tail is an accompaniment of good flight powers. A possible explanation of this is suggested by Dr. J. T. Nichols in a later number of the National Geographic Magazine, where he calls attention to the forked tails of the speedier fish. His theory is that the center of the tail is the meeting point of the stream line currents proceeding along the body and that the cutting out of the tail here reduces drag. It also appears in current literature that a remarkably speedy motor boat has lately been built by cutting away the underbody aft in an analogous fashion. It would seem that the effect produced in water currents would probably be seen in air movement with a result proportional to the reduced density of the medium. The forked tail may have a greater meaning than has heretofore been imagined. Mr. Averill has suggested a promising line of investigation.

Under "General Notes" are the following:

The Willet in Nova Scotia, pp. 581-582.

Breeding of the Semipalmated Plover in Yarmouth Co., N.S., pp. 583-584.

The Black-polled Warbler and Bicknell's Thrush in Yarmouth Co., N.S., pp. 591-592.

Notes on the Acadian Sharp-tailed Sparrow, pp. 587-589.

The Singing of the Ruby-crowned Kinglet, pp. 594-596.

Notes from Seal Island, N.S., pp. 596-597.

All by Harrison F. Lewis.

The Willet in Nova Scotia, by Chas. W. Townsend, pp. 582-583.

Most of these are summarised by their titles. The Eastern Willet as a breeding bird seems to be increasing in Nova Scotia under the beneficial protection of the Migratory Birds Convention Act. It was only lately supposed to be nearly extinct but may after all come back again. For some time all Willets on the Atlantic coast were referred to the western form, but now it is on the cards for observers there to sharpen their eyesight once more and differentiate between them. All birds now can not be automatically referred to the Western as the only geographic possibility. Had not observers been but too willing to rely on geographical preconceptions in identifying we might have known some time ago that the Eastern Willet was still to be reckoned with.

Under "Recent Literature" the following papers are mentioned or reviewed.

The Eyes of the Burrowing Owl, with Special Reference to the Fundus Oculi, by Dr. Casey Wood, Reprinted from *Contributions to Medical and Biological Research, dedicated to Sir William Osler in Honor of his Seventieth Birthday by his pupils and Co-Workers*, pp. 819-823.

A new Jay from Alberta, by James Lee Peters, *Proc. New England Zool. Club*, VII, pp. 51-55.

This is a new subspecies of Canada Jay, *Perisoreus canadensis albescens*, described from Red Deer, Alta. from specimens in the Brewster collection now in the Museum of Comparative Zoology, Cambridge, Mass. It is declared to be paler than other known races.

Report of the Canadian Arctic Expedition, 1913-1918, Vol. IX, Part E., Acanthrocephala.

In this is described a new species of acanthrocephala, *Filicollis arcticus*, parasitic on the King Eider in the western Canadian Actic. It is interesting to note that the King Eider does not carry the same infestation throughout its range. On opposite sides of the Arctic Circle it seems to be parasitized by acanthrocephala representing two distinct genera.

Notes on the Harlequin Duck (on British Columbian Coast), by Chas. E. Alford, *British Birds*, XIV, June, 1920.

The Trumpeter Swan in British Columbia, by Allan Brooks, *London Field*, July 31, 1920.

THE CANADIAN FIELD-NATURALIST

VOL. XXXV. GARDENVALE, QUE., MARCH, 1921 No. 3.

THE EVENING GROSBEAK IN CANADA.

By P. A. Taverner.

Published by permission of the Director of the Victoria Memorial Museum, Ottawa, Canada.

Perhaps to no American bird is there greater interest attached, aesthetic or scientific, than to the Evening Grosbeak, *Hesperiphona vespertina.* Appearing as it does in the dreariest season of the year, when birds are few and color absent from the landscape, its wonderful yellow color and plaintive whistle always attract attention and interest. Even those who rarely perceive unusual bird visitors note the appearance of the Evening Grosbeak, and the winters of its occurrence always call forth letters in the papers and floods of enquiry of the local ornithologist. Over and above its showy beauty in an empty landscape the very mystery that surrounds the bird piques our curiosity. For it comes only at irregular and unexpected intervals, and, after tarrying awhile, disappears into the unknown; nor with all our present knowledge of the movements of birds can we yet say authoritatively whence it comes or whither it goes. It is some late evidence on this point that has suggested the appropriateness of a partial review of our knowledge of the species at this time.

The species was first introduced to science and popular attention by W. Cooper, who, in 1825, in the *Annals of the Lyceum of Natural History of New York,* described a specimen obtained by H. R. Schoolcraft at Sault Ste. Marie, Michigan, on April 7, 1823. Schoolcraft was told that it was common at Fond du Lac and about the head of Lake Superior. Further information was obtained from Major Delafield, who noted the bird in August of the same year on the Savanna River, north-west from Lake Superior, where it visited his camp, singing only in the evenings. Impressed by its mournful notes, Major Delafield inferred that it dwelt "in dark retreats and left them only at the approach of night." It was from this circumstance that the bird received its name *vespertina.*

For many years occurrences of the bird within the view of students were few and far between; they but whetted the scientific appetite for information without satisfying it. The earliest record of the species in south and south-western Ontario appears to have been the winter of 1854-55, [1] when birds were taken at Toronto, Hamilton and Woodstock. In 1866 Thomas McIlwraith [2] records hearing of them at Hamilton, though he himself did not actually see them. In 1879, in the *Bulletin of the Nuttall Ornithological Club,* Coues compiled a history of the species, but, as far as the east was concerned, he recorded little more than that it was a rare and erratic winter visitor south to the northern states, though commoner and more widely-diffused in the mountains of the west. Its first general appearance in large numbers in eastern Canada occurred in the winter of 1889 and 1890; this was made the subject of a full report in the *Transactions of the Canadian Institute* for 1891. The *Auk* and the *Ottawa Field-Naturalist* contain numerous notices of the species about this date that add to the records of its occurrence, though they furnish no new information. Meanwhile the Western Evening Grosbeak, *Hesperiphona vespertina montana,* had been described from New Mexico in 1879. It was discover-

[1] Fleming, Auk, xxiv, 1907, p. 78.
[2] Pro. and Comm. Essex Inst., V, 1866-67, pp. 79-96.

ed breeding in Arizona in 1884, in California in 1887, and eventually was found to nest locally in the western mountains as far north as British Columbia.[3]

Although considerable light has been thrown on the breeding of these western birds, our knowledge of those that visit us in the east has not advanced to the same degree. The Mackenzie and Athabasca valleys have been well worked, but no Evening Grosbeaks have been found there in summer. Preble failed to locate them in the Churchill River system, and the country south of Moose Factory on James Bay has often been traversed without result. There is still room for the species in unexplored Ungava, but its winter distribution seems to indicate a more western origin. L. O. Scott, both alone and in association with M. Bedson,[4] reported the finding of nests just outside of Winnipeg; he repeated, too, some Indian assertions about the bird breeding in the Peace River district. Later S. S. Stansell[5] reported nests near Edmonton, Alberta, and defended his statements when questioned. None of these records were taken seriously, as they came from localities where other men had worked without discovering corroborative evidence; but some of them at least may have to be reconsidered in view of the new data that was obtained last year. Albert Lano,[6] for example, has reported that he saw the species in July and August, 1900 and 1901, in Aitkin Co. Minnesota; and Chas. E. Johnson[7] has recorded them as present in Lake Co. of the same state during the corresponding months of 1914 and 1915. Most important of all, William Rowan[8] found the birds at Gimli, Man., about forty miles north of Winnipeg, in late May and early June, 1920. They appeared to be mating at the time, and remained there until July and early August. On July 26 he took a bird of the year still being fed by its mother at Indian Bay, Shoal Lake, on the Manitoba-Ontario boundary (not the lake of the same name north of Winnipeg). This is the first substantiated breeding record for the species away from the western mountain region. It may also be noted that the writer[9] found the birds in late May, 1917, at the other Shoal Lake north of Winnipeg, not far west of Gimli; at the time, however, he regarded them merely as late migrants and in consequence made no systematic search for nests.

There is some evidence therefore to show that the nesting area of the Eastern Evening Grosbeak includes not only the country from which it was reported by Major Delafield in the original description of the species, but that it extends along the northern forest belt from Lake Superior to some point westward. It is true that Mr. D. Blakely of the Victoria Memorial Museum collected ornithological specimens throughout the season of 1919 on Lac Seul, Ont., about 125 miles east and a little north of Indian Bay, without seeing it, and that Capt. Angus Buchanan[10] traversed the country between Prince Albert, Sask., and Reindeer Lake with equally negative results. But these apparently blank spaces in the range of the bird can be explained by the supposition that it is nearly as erratic in its summer as in its winter distribution, changing its breeding localities from summer to summer in the same way as some other northern species appear to do, for example, the Crossbills, the Pine Grosbeak and the Bohemian Waxwing. The Evening Grosbeak, in fact, does seem to be erratic in this respect in the west, where its breeding in any locality at one season is no surety that it will breed there the next, or that it bred there the season before. Such an irregularity would largely explain why we have isolated records that remain unverified by previous or later work in suspected or adjacent regions. Moreover the fact that the nests of the Evening Grosbeak are situated (in British Columbia at least) high in the taller evergreen trees and that the birds become retiring and suspicious in the breeding season further reduces the probability of find-

[3] The history of this species will always be associated with the name of the young ornithologist Francis J. Bittwell, who was killed in the presence of his wife, during their honeymoon, while attempting to reach a nest of the Western Evening Grosbeak in New Mexico.

[4] Ottawa Field-Naturalist, xiii, 1899-1900.

[5] Auk, xxvi, 1909, pp. 390-400, and Ottawa Field-Naturalist, xxiii, 1909, pp. 125-127.

[6] Auk, xxxvii, 1920, p. 455.

[7] Ibid., pp. 541-551.

[8] Ibid., pp. 585-586.

[9] Can. Field-Naturalist, xxxiii, 1919, p. 14.

[10] Fleming, Can. Field-Naturalist, xxxiii, 1919, pp. 109-113.

ing them at this time without a special search.

In regard to the winter range of the species, as contrasted with its summer range, there has been a decided change of late years, a change that is very apparent at Ottawa, but observable probably elsewhere as well. The old reports of the species would indicate that originally it was a very rare as well as a very erratic visitor, although numerous enough whenever it did come. Latterly, however, it has appeared so much more often that it can be regarded as almost regular. It is true that none have been seen this winter, but then this has been an unusual winter in every way, and if Evening Grosbeaks have not appeared, neither have other species upon whose presence we can more usually count. According to the record, while the Evening Grosbeak has gradually become more regular in the locality of Ottawa, other winter species such as the Pine Grosbeaks, the Crossbills, the Bohemian Waxwings, the Eastern Horned Larks, the Red-Polls and the Snow-Buntings have become much less so. A possible, even a probable explanation of this newly-acquired regularity of the Evening Grosbeaks may be found in the recent spread of the Manitoba maple, *Acer negundo*. John Macoun has recorded what was probably nearly the original distribution of this tree in Canada.[11] Outside of a few trees growing in Toronto he did not meet with it again to the west until beyond Lake Superior in the northern parts of the prairie provinces. Now the samaras or winged seeds of this maple hang to the tree all winter, and whenever obtainable constitute the principal food of the Evening Grosbeak. Indeed, when the seeds finally drop off, the birds descend to the ground and rarely leave the locality until the supply is exhausted. In the early days, with so large an area of country barren of their favorite food, it is not surprising that the birds only strayed over it in exceptional winters under pressure of food failure elsewhere. Today, however, the distribution of this maple is radically different. It is a hardy, quick-growing shade tree, and in consequence has been planted extensively, not only about many farm houses, but in all the villages, towns and cities that have sprung up to the east and north of the Great Lakes. Thus a baited pathway has been laid from the usual summer home of the Evening Grosbeak right to our doors, and undoubtedly the bird has taken advantage of this fact to travel our way more often than it did before. It may even be prophesied that with the further increase of the Manitoba maple northward, the Evening Grosbeak will find sufficient food nearer its summer home and again become scarcer in our neighbourhood; for it was the extension of cultivation in similar localities that seems to have brought about a like change in the movements of the other birds that I have mentioned.

The Western Evening Grosbeak, *Hesperiphona vespertina montana*, was separated from the eastern bird on account of some slight colour differences and a relatively greater length of bill. For a long time our British Columbian Grosbeaks were, as a matter of course, referred to the western race. It has been evident for some time, however, that while they may be different from the eastern birds, they are certainly not the *montana* as originally disposed, with which they agree neither in colour details nor in the shape of the bill. Jos. Grinnell, the first to try to unravel the subject,[12] subdivided the birds previously grouped under the head of *montana* into three races, *montana, californica* and *brooksi*, and referred the British Columbian and the Washington birds to the last named subspecies. He based his distinctions on variations in colour and bill form. Now one trouble in estimating the values of these different characters is the difficulty of obtaining comparable material. All our specimens of true eastern *vespertina* are in winter plumage, while the majority of British Columbian specimens are in summer condition. Allowing for this, however, an examination of the few winter western birds available seems to indicate that while the width of yellow on the forehead and the back coloration of the male in the *brooksi* can be readily matched in specimens of the eastern bird, the dark-

11 Macoun, Cat. Canadian Plants, Pt. I, Polypetalae, 1883.

12 Grinnell, Condor, xix, 1917, pp. 17-22.

coloured head of the female *brooksi* does really enable us to separate the two races with some confidence. The bill averages a little slenderer in *brooksi* than in eastern specimens, but this is not a reliable guide, for the difference is so slight that it is hardly recognizable even in the figures that accompany Grinnell's description, and at times is quite swamped by individual variation.

I have been fortunate in having submitted to me for examination the two birds that were taken by Rowan at Indian Bay. One is an adult female in rather worn and faded breeding plumage, the other her fully fledged young still suffused on back and breast with the ochraceous buff that is lost in the post-juvenile moult before the first winter. There can be no question that the latter is a bird of the year, and the fact that it was still being fed by its parent indicates that it was raised within a short distance of where it was taken. The parent that was captured is fortunately a female, and consequently of the sex needed for subspecific determination, but the disturbing fact is that it bears the colour marks of the western bird, *brooksi*, rather than those of the expected eastern *vespertina*. Its head, in contrast with its back, is decidedly dark, and the specimen generally, in spite of its slightly worn and faded condition, is identical with birds from the Okanagan Valley, B.C. It is true that the bill is large and stubby rather than attenuated, and that a large stubby bill is a postulated character of the eastern bird; but, as mentioned before, this, in the opinion of the writer at least, is too variable a character to be of much service in determining individual specimens. Of course, it does not seem reasonable that the British Columbian Evening Grosbeak, *brooksi*, breeds eastward to Lake Superior nor would I care to suggest such a conclusion except to negative its probability. We may prefer to regard this specimen simply as a variant of the eastern *vespertina*, or perhaps suspend judgment until further evidence is secured.

This unfortunate occurrence of abnormality in a unique specimen brings up the important subject of the determination of slightly characterized races when they are found far from their natural habitats. Birds with their great mobility certainly can and do wander to the most astonishing localities, and it is not impossible for occasional specimens to appear far from the land of their origin and direct blood relatives. In such cases are we to identify entirely from the characters that the birds exhibit? If we do, we are bound to make a multitude of errors through mistaking individual for racial variations. On the other hand if we allow considerations of geography to influence our identifications we are just as certain often to twist the evidence to suit our geographical preconceptions.

There are good reasons for either course. If a race means anything it must be based on germinal characters and denote blood relationship between the individuals composing it. An albino Negro would not be a Caucasian, however close the superficial resemblance might be. The very fact that an isolated community of a species has developed certain common characteristics indicates the possibility, perhaps even suggests an innate tendency, of the species as a whole to vary in that special direction; it would surprise us less to find such a variation sporadically in individuals of other communities than one the possibility of which has not been demonstrated. In other words, we can expect to find, even in pure lines of descent, disturbing variants (sports, if you will) resembling established races more often than departures in novel directions.

These considerations are against identifying by character alone without considering geography as an indication of probable descent. However, to lay too great stress on geography is equally dangerous and misleading. For if we plot distribution on the determination of specimens we certainly must not make postulated distribution, the basis for such determination or we shall be reasoning in a vicious circle. All we can do in doubtful cases is to acknowledge our ignorance, and content ourselves with naming the species, leaving the determination of the subspecies open for further investigation or fuller data.

In this case of the Evening Grosbeak, then, although we may be firmly convinced that the Indian Bay breeding bird is of

eastern stock, it does not seem that we are warranted in calling it anything more definite than *Hesperiphona vespertina*, the Evening Grosbeak, leaving its eastern or western affinities, *vespertina* or *brooksi*, open for future consideration.

THE LARGER FRESHWATER CRUSTACEA FROM CANADA AND ALASKA.

By Frits Johansen.

(Continued from Vol. XXXV, page 30)

III.—B. TADPOLE-SHRIMPS.

This suborder (Notostraca) is distinguished from the Anostraca by having a broad and flat dorsal shield covering the body, and from the Conchostraca by having a depressed body, and the shield single and attached at the front, not double (as a clam-shell) and confluent with the body dorsally.

The "tadpole-shrimps" do not have the antennae developed to the extent of the fairy-shrimps and clam-shrimps except in their larval stages, but both pairs are diminutive dwarfed stubs, especially the second pair. The paired eyes are not stalked, but sessile and placed close together dorsally near the front edge of the carapace. The mouth parts are well developed, and behind them follow a great number of foliaceous body legs (similar to these of the fairy-shrimps), of which the last (11th) pair in the females form a peculiar flat and rounded pouch (like a watch-glass) containing the eggs. The first leg-pair is the longest and ends, with *Apus*, in three long filaments, used as sensitive organs by the adults and also as swimming-organs by the younger stages. Behind the carapace protrude a varying number (1 to 3 dozen) of abdominal segments (the tail), which end in a plate (telson) flanked by two long filaments (cercopods). The color of the adults is a brownish green,[1] the carapace and eyes being the darkest. These animals thus remind one forcibly of the marine "horse-shoe-crabs" (*Limulus*) and as in the latter there is much movement possible between the shield and the body, of great importance to the animal when digging into the mud or turning around. The interior organs are similar to those of the fairy-shrimps though the heart is shorter and there is a large, paired shell-gland.

Locomotion is accomplished principally by the foliaceous legs similar to those of the fairy-shrimps, and also by twistings of the tail. The food consists of small freshwater invertebrates (Entomostraca, etc.), or dead animals (even of its own species) which it catches in the water or by tunnelling in the surface of the mud bottom, passing any captured prey along to the mouth parts by the aid of the foliaceous legs. The larvæ hatch in the spring as clumsy nauplii or metanauplii from the ripe (red) eggs deposited in the fall upon water-plants, etc.; they differ much less from the adults than the larvæ of the two other suborders (fairy-shrimps and clam-shrimps), having traces of the carapace and abdominal segments, and later short cercopods. On the other hand particularly the second pair of antennæ are far longer and more powerful than is the case with the adults, and function as the principal organs of locomotion. During the summer the larvæ grow on and gradually assume the shape and colour of the adult. In some of the species the females attain a length of several centimeters, while the males are somewhat smaller. The latter are generally far less numerous than are the females and often first make their appearance in the latter part of the summer; it is therefore probable that when this is the case the eggs the females carry in the beginning of the summer are produced parthenogenetically, though it must

[1] That of the larva first orange, later yellowish.

be remembered that the eggs [2] are carried a much longer time by the mother animals and develop more slowly than with the fairy-shrimps. Judging from the arctic form (*Lepidurus arcticus*) both sexes apparently live more than one year and probably hibernate in sufficiently deep ponds or lakes, supposing, of course, that they do not freeze into the ice, are not killed by the drying-up of the pond, or that their life-cycle is not completed. The larvæ apparently are too few and frail to keep the numbers up alone from year to year; this, coupled with the comparatively (i.e. compared with the fairy-shrimps) slow growth of the young individuals and the large size they have to attain, makes a normal age of several years a necessity, at least for the females.

While, so far as we know, the arctic form occurs year after year, the same is not the case with the more southern species. In some years the latter are entirely absent, or only females occur, and in this respect they are not unlike the "clam-shrimps". To a still larger extent than is the case with the "fairy-shrimps" the "tadpole-shrimps" and "clam-shrimps" are very erratic in their occurrence, especially outside the arctic; smaller ponds and pools may be teeming with them, while they are not found in others, nor in lakes close by; again they may be plentiful only at a certain time of the year.

Of the tadpole-shrimps only two genera are known, both occurring in the new as well as in the old world. They are easily separated by the spatulate or triangular outgrowth from the telson present in the one (*Lepidurus*), but absent in the other genus (*Apus*).

To *Lepidurus* belong about half a dozen species, to *Apus* about a dozen, of which four of each genus have so far been recorded from this continent. It is interesting that no Apodida have so far been found east of a line from King William Land south to Manitoba and the middle States, though the Arctic species is apparently circumpolar and has been recorded from Labrador and Greenland.

Of the four species of *Lepidurus* two have so far only been recorded from Colorado and California and are likely to occur neither in Canada nor Alaska. A third species (*L. couesii*) was originally described by Packard from Utah and Montana and has since been collected in three of the western provinces of Canada (Manitoba, Saskatchewan and Alberta); it probably occurs also in British Columbia. Its carapace is large, so that only five "tail" segments and the spatulate telson are uncovered. Packard's specimens (both sexes) from Montana were taken in the first week of July, 1874, and had an average length of about 2cm. (exclusive of the cercopod-stylets). The Alberta specimen (see below) is nearly of the same size (it was dried up when I found it) as a specimen (female) about 3 cm. long from Dufton, Sask., now in the Royal Ontario Museum, Toronto; the latter was collected by a university student on June 20, 1913.

Prof. O'Donoghue, of the University of Manitoba, writes me (June, 1920) that he has recently collected this species (*L. couesii*) near Winnipeg, where it "is extremely common in the ditches on the west side of the south end of Lake Winnipeg". He has promised to send me specimens of it.

From Prof. A. G. Huntsman, of Toronto, I have recently received a number of specimens of the same species from one to two cm. in length. He collected them on June 11, 1920 in sloughs three miles north-east of Medicine Hat, Alta., where they occurred together with the fairy-shrimp *Streptocephalus coloradensis* (see page 29), and clam-shrimps (see later).

We have in the museum here in Ottawa a specimen of the same species apparently collected by J. B. Tyrrell in southern Alberta or British Columbia in the eighties. I found it among a number of other invertebrates from land and freshwater collected by Tyrrell at that time, but there was no date with it, and Mr. Tyrrell was not able to recollect the locality or date when I sent him the specimen. Beyond what is given here nothing is known as to the northern limit for this species; apparently, however, it is not found in the Yukon and the Northwest Territories, nor in Alaska, though it may occur in the most southern part of the last-named territory.

[2] At least the "winter-eggs."

As to its life-history (development), the stages between the eggs and the adults are unknown.

The fourth *Lepidurus* species is the well-known, circumpolar form (*L. arcticus* Pallas) (*L. glacialis* Kroyer), first well described from West Greenland. It is immediately recognized by the fact that the telson ends in a triangular (not spatulate) plate obtusely pointed and with spiny edges. Its distribution is very similar to that of *Branchinecta paludosa,* having been recorded from Greenland [3], Iceland, Spitsbergen, Northern Scandinavia, Novaja Semlja, Siberia and on this continent from Alaska to Baffin Bay. Its southern limit is not definitely established, but indicated by the following records in North America, Pribilof Islands, Teller, Point Barrow and Martin Point, Alaska; south side of Dolphin and Union Strait, King William Land and Labrador. Several of these records are based upon my own collections made on the Canadian Arctic Expedition, and the species will be treated in detail in the reports (Vol. VII, Part G) of that expedition. I have also given a detailed account of its biology and development as I studied it in Northeast Greenland (*Meddel. om Groenland,* Vol. 45, p. 333-37). Its structure, etc., has been well described and beautifully illustrated by Sars (1896) p. 68-82, Tab. 11-13. Its life-history is now fairly well known. The hibernating eggs hatch in June, and the nauplius, which is not unlike that of *Branchinecta,* soon assumes the metanauplius stage (see above). It is rather sluggish and seems to venture forth over the mud-bottom only when it has grown considerably and assumed the adult's color; even then it often takes refuge under the larger individuals. I secured the metanauplii in Greenland in June, but the youngest individuals I found during the Canadian Arctic Expedition (taken on July 3, 1916, at Bernard Harbour, N. W. T.), were 3 mm. long, and practically like the adults. Both in Greenland and in the Canadian Arctic I first secured the few males in August, though adult females together with younger ones were secured from the end of July on; the latter first had ripe eggs in their brood-pouch in August. The last *Lepidurus* in the year were secured on October 6, 1915, together with the new Branchipod mentioned p. 29 (*Artemiopsis stefanssoni*). Even in the autumn and fall the animals range in size from about ½ cm. to 2 cm., thus proving that they represent both that and the preceding years' brood (generation).

All the *Apus* species occurring on this continent have so far been recorded only from the middle and western parts of United States, and none from Canada or Alaska. One of them (*A. longicaudatus*) has, however, been recorded from Yellowstone River, so it is possible it ranges across the boundary into Alberta. Of the species occurring in Europe, some are interesting because they have been known for a much longer time than the American representatives. The genus was first described in the first half of the 18th century, and was subsequently listed by Linnaeus under the name of *Monoculus.* The genus *Lepidurus* was not separated out until more than half a century later, by Schaeffer.

A parasitic Trematode (*Distomum apodis* Pack.) has been observed in the egg-sacks of the genus *Apus* in North America (see A. S. Packard, in *Amer. Naturalist,* Vol. XVI, 1882, p. 142).

G. O. Sars in "*Crustacea*" (2d. Norwegian Arctic Expedition 1898-1902 ("Fram"), 1911, p. 15) records *Lepidurus apus* (Lin.), from a freshwater-swamp at Cape Rutherford, east side of Grinnell Land (about lat. 79° N., long. 75° W.), on August 29, 1898. [4] This is the first time this species has been found in the arctic regions, and in America. It is, I believe, the same species as *L.* (*Apus*) *productus* Bosc., known from a number of places in Europe.

(To be continued).

[3] West coast up to Foulkefjord and Northumberland Island, east coast at least to 77° N.

[4] Lepidurus arcticus was also secured by this expedition at Cape Rutherford.

ASSOCIATION, COMMENSALISM AND PARASITISM AMONG MARINE ANIMALS IN THE STRAIT OF GEORGIA.

BY C. MCLEAN FRASER, PH.D., F.R.S.C.

Professor of Zoology, University of British Columbia, Vancouver, B.C.

The conditions affecting marine life are sufficiently diversified in the waters of the strait of Georgia to supply material for investigation in every branch of zoology but no branch is better served than ecology.

In making ecological observations one is necessarily struck with the numerous instances of association, commensalism and parasitism, states which differ only in degree and between which complete intergrading is evident. The association may be quite casual as in cases where two or more species are found in proximity on account of the fact that they live on the same kind of food. The relationship is much closer in other cases where the species remain permanently in proximity, in some instances as much for mutual protection as for common feeding. It is but a short step from this to commensalism where two species (seldom more) bear such an intimate relation to each other that one is seldom found or never found without the other. They may be mutually helpful, and, if not evidently so, at least one must not be harmful to the other. The condition of one species feeding with another differs comparatively little from that of one species feeding on another, and so parasitism appears, going from the one extreme where the parasite is free to attack its host, to move about from one host to another or even to live apart from the host, to the other extreme where the parasite in the adult state has lost all power of locomotion and is otherwise so degenerate that it lives only by absorbing highly complex nourishment from the host.

The term "parasitism" is often loosely used in connection with such sessile forms as hydroids, bryozoa, etc., where there is no evidence of such. The larvæ of these forms, when they reach the end of the free-swimming period settle down, in most cases, on anything available for support throughout the rest of their life. In very few instances is there any evidence that they receive any nourishment from the supporting object which consequently cannot be a host. It evidently cannot be a host when the support is a piece of rock or dead shell, and it is usually no more so if this is an animate object.

As an instance of more or less casual association the young herring and the stickleback will serve. The herring hatches out in March or April, and by July or August has taken on the real herring appearance. It gathers in schools to feed around wharves and floats and near the shore at various places, where it remains until it is about a year old. During this period the individuals mingle freely with the sticklebacks that are in that vicinity for the same reason, so that one seldom sees the one species without the other. Later the herring goes out to deeper water and the association is at an end.

Without going into detail other instances may be noted. The little blenny, *Anoplarchus*, is found with the cling fish, *Caularchus*, under stones that are left exposed at low tide, and with these the singing fish, *Porichthys*, often appears. Schools of sand launces are often associated with schools of herring. Viviparous perch, *Panerodon*, and sometimes *Tæniotoca*, occur in the same locality as the rock cod, *Sebastodes*. This is true of the two species of clams, *Saxidomus* and *Paphia*, and of the heart-urchin, *Schizaster*, the brittle-star, *Amphiura*, and the holothurian, *Molpadia*.

A somewhat closer association appears between two Chaetopterid annelids, a large one and a small one, and both of them with a Phoronopsis. They are all tubiculous species, living in the fine sand a short distance above lowest low-water mark. Where one is found the others are sure to be present. In certain localities, only exposed at the lowest tides, where coarse sand or fine gravel is mixed with mud, a *Synapta* is plentiful, and with it a brittle-

star, *Amphiura,* with long, slender rays. In appearance they have very little in common and yet they always seem to occur together.

The best as well as the most common and most extensive association is found almost everywhere in rough, rocky bottom at a depth of 25 or 30 fathoms in the open strait. The most conspicuous part of the association is made up of three sponges, *Bathydorus dawsoni, Rhadocalyptus dowlingii* and *Aphrocallistes whiteavesianus,* the first two in particular being supplied with numerous siliceous spicules that make them troublesome to handle. With these are associated a spiny ascidian, *Tethyum igaboji* (the only very spiny ascidian to be found in the strait), a spiny brittle-star, *Ophiopholus* sp., and two species of the genu *Euphrosyne,* spiny annelids. These are all spiny creatures and hence they form a very well protected group. With these there may be other species of rarer occurrence; other species of annelids and sponges, and a brittle-star. Many species of bryozoa and hydroids are attached to the sponges but none of them seem to be essential to the association.

Examples of commensalism are numerous. The two species feeding together usually belong to different phyla and hence they are hard to group. It may suffice to arrange them according to the phyla to which the major members belong. The vertebrates do not supply instances. Apparently there is in this region no counterpart of the relation between the pilot-fish and the shark. Possibly the nearest approach to it is the case of the little sculpins that wait around for the crumbs that are dropped when the crab, *Cancer productus,* is having its meal of fresh barnacles.

The ascidians serve better, as with *Ascidiopsis paratropa* in particular, but also with *Phallusia ceratodes, Ciona intestinalis* and *Tethyum aurantium,* the hydroid, *Endocrypta huntsmani,* finds a close relationship, since it is found attached to the wall of the branchial cavity. A Pinnotherid has been found commensal with *Tethyum igaboji.*

Among the molluscs, the most familiar examples are found in the clams, *Mya* and *Schizothærus,* where various Pinnotherids or pea-crabs are much at home in the mantle cavity. The condition here is extreme, for the body of the horse-clam in particular may be 16 or 18 inches down in the sand. The crab must therefore depend on the circulation in the clam for its oxygen as well as for its food supply. Another bivalve, the scallop or *Pecten,* may have either one of two species of sponges living commensal with it, the two species being *Esperella adhærens* and *Myxilla parasitica.* With a much smaller bivalve, *Axinopsis sericata,* occurs the hydroid, *Monobrachium parasitum.* The offensive zooids of *Monobrachium* extend over the ventral border of the valve and probably protect the mollusc as well as the hydroid colony. The key-hole limpet, almost invariably, has an annelid lying in the mantle cavity parallel to the foot, of a color that matches that of the foot and gills.

Among the crustacea there is what might be called a forced commensalism in the case of the decorating crab. Hydroids, sponges, bryozoa, etc., grow from many places on its exoskeleton, but the beginnings of the colonies are placed there by the crab itself. The hydroid, *Hydractinia aggregata,* is always found growing on a shell that is inhabited by a hermit crab, *Pagurus splendescens* (possibly other species as well). Here the arrangement is evidently mutually beneficial. The hydroid colony disguises the home of the crab and on the other hand it obtains food material let slip by its messmate. This is definitely indicated by the fact that the nutritive zooids are much more numerous near the margin of the shell, to the exclusion of the generative zooids that are always situated farther back. In some cases the hermit-crab, *Pagurus ochotensis,* (and possibly other species), has a closer association than that with the hydroid, when it has an annelid, *Nereis,* living with it within the shell.

No instance has appeared where an annellid is the major commensal except where both commensals are annelids. The Polynoid that lives in the tube of an *Amphitrite* is an example.

Among the Echinoderms one starfish, *Evasterias troschelii,* is seldom found without a commensal Polynoid, that matches the color particularly well but no better than the Polynoid found on the Holothu-

rian, *Stichopus*. Another Polynoid is commensal with the starfish, *Solaster stimpsoni*.

The jellyfish supply the only examples among the Cœlenterates. The largest jellyfish found along the coast, *Cyanea arctica*, has usually one or more species of amphipods and sometimes other crustaceans among its tresses. The actinian, *Bicidium æquoreæ*, is found attached to the umbrellar surface of *Aequorea forskalea* and of *Thaumantias cellularia*. This actinian is spoken of as being parasitic but it is not probable that it is so. Finally, in the Porifera, the hermit crab, *Pagurus brandti*, appears surrounded by the living sponge, *Suberites latus*.

In taking up parasitism only ectoparasitism will be considered. The crustacea provide much the greater number of parasitic species. One vertebrate is probably parasitic. The lamprey, *Entosphenus tridentatus*, attaches itself to the salmon and uses it for transportation purposes, but it is scarcely possible that the skin of the salmon is so thoroughly pierced for this purpose alone.

One mollusc is apparently parasitic although it may be merely commensal. This is the species that has been called *Lepton rude* by Whiteaves and *Ericyna rugifera* by Carpenter, found attached to the surface of the abdomen of the sand shrimp, *Eupogebia pugettensis*. The annelid, *Myzostoma*, is parasitic on the Crinoid, *Florometra serratissima*. Trematodes are commonly found in the gill cavity of several species of fishes, attached to the surface, and some blood-red nematodes have been found on the clingfish, *Caularchus meandrinus*.

The copepods make up a large portion of the list of parasitic crustacea. There is one parasitic isopod, *Phyllodorus abdominalis*, common on the abdominal surface of the sand shrimp, *Eupogebia pugettensis*, and a Rhizocephalan, *Sacculina*, on different species of shrimps.

Parasitic copepods were discussed in a paper read before the Royal Society of Canada in 1920. Those parasitic on fish are very numerous and of many species. In these there is the greatest variation in the manner in which parasitism has affected the parasite. *Galigus gurnardi*, for instance, shows no great degeneration and is almost as freely moving as non-parasitic forms. It moves readily about on the host and has been found with the plankton where it must have been swimming freely in the sea. From such a condition there is a gradually increasing degeneration until such a shapeless, helpless mass as that of *Chondracanthus* or *Clavella* is reached.

The only parasitic copepod found elsewhere than on fish, was a small, red species (undetermined) which is common on the red sand shrimp, *Calianassa californiensis*. It is quite possible that a more careful observation would bring others to light.

GLEANINGS FROM THE CANADIAN WEST. — PART I. AVIAN FAUNA OF ISLAY, ALBERTA.

By J. Dewey Soper.

While accumulating the notes embodied in the following pages I felt congratulated in my fortune to be again haunting comparatively unknown fields in this delightful science. By unknown fields, of course, I refer to the geography in connection with the faunal forms that I mention, not to any original intimacy with the species themselves. The most, apparently, which a new region may do for one at this time, barring the extreme and improbable fortune of discovering new members of our country's fauna, is to strengthen, correct, or establish lines of distribution. All the facts proffered may long since have been known to some one, perhaps even published in papers that I have as yet overlooked. Nevertheless I enjoyed a rare satisfaction in winnowing from the Islay prairies whatever of interest or value may appear in this article. Here, in this little, isolated

western village, there existed such freedom of movement, such ready accessibility to the open and its occupants, that one seemed surrounded always by peculiar benefits.

Aside from the singular charm and seductiveness of the northern prairies in autumn, birds and mammals abound, making a visit there of very practical interest. I would not venture to describe the Islay region as inordinately rich in species, nor, on the other hand, markedly poor, remembering the latitude. In point of individuals, however, I will refrain, as I might be induced to expatiate too freely. I would say briefly in this connection, though, that it is my impression that one must visit a favorable place in our Canadian West fully to realize the great flights of waterfowl from the north which obtain during the autumnal migrations. Literally thousands upon thousands pass over a given locality in a single day, followed day in and day out at times, over areas of wonderful extent, with increasing or decreasing numbers. To be on hand therefore during these flights is a privilege to be cherished to the full.

I remained at or near Islay from August 29, 1919, until November 30 following, about fourteen weeks in all. My notes were collected under divers circumstances with no thought of publication at the time, and have since been pilfered from a rather promiscuous journal. Any lack of cohesion or consistency may possibly be traced to these circumstances.

Of the fifty species of birds recorded at Islay, a great many may be regarded solely as migrants, especially among the water-birds, although not all of these can be considered such. Before the advent of the settlers, most if not all of the waterfowl mentioned would, I believe, be found as breeding summer residents in the immediate vicinity. So many of the sloughs throughout the country have of late years dried up, that now numbers of these waterfowl are forced to other parts to rear their young. The majority of the smaller species will, in all probability, be found as summer residents. As concerns the general status of a region's bird life, an autumnal list certainly leaves a great deal to be desired. Nevertheless there may be something of interest and value even in an incomplete list like the present.

AUTUMN BIRDS OF ISLAY AND VICINITY.

1. HORNED GREBE (*Colymbus auritus*). A few believed to be this species noted on Laurier and Whitney Lakes, Sept. 1.

2. HERRING GULL (*Larus argentatus*). The only individuals seen were two riding the waves near shore on Laurier Lake, September 1.

3. MALLARD (*Anas platyrhynchos*). Noted on various occasions throughout the season. What were suppositionally identified as mallards passed south near sundown on October 18, in a fast flying flock one hundred and fifty strong, strung out in a long single imposing line at right angles to the line of flight.

4. SHOVELLER DUCK (*Spatula cyanoptera*). Two individuals collected at Whitney Lake.

5. RUDDY DUCK (*Erismatura jamaicensis*). Observed on several occasions during September.

6. CANADA GOOSE (*Branta canadensis*). During migration very common. On the night of September 16, a large flock loudly "honking" passed over the town. Large companies bore southward all day September 18.

7. BLACK BRANT (*Branta nigricans*). I make this a hypothetical entry. On September 18 and 19, flocks named by an old gunner as brant passed southward calling regularly as they bore along. According to his statements their notes were easily distinguishable from others of their kin. The brant of any species, however, are supposedly rarely if ever to migrate inland. In Macoun's catalogue I find a note by Turner for the present species reading: "Few are seen in the fall as they then pass through the interior going south." I take it from this that their occurrence inland is not improbable.

8. AMERICAN BITTERN (*Botaurus lentiginosus*). One individual only observed on September 5, as it rose with a hoarse "squawk" from a mud-bar on the Vermilion river.

9. WHOOPING CRANE (*Grus americana*).

A solitary bird of large size, snowy whiteness, carmine coloring on the head and black primaries, was noted at 10 a.m., October 15. It was flying south-eastward at the rate of about twenty-five miles an hour.

10. SANDHILL CRANE (*Grus mexicana*). Flocks observed on September 18, 24, 25 and 27. The flock of September 25 was composed of 168 individuals.

11. WILSON SNIPE (*Gallinago delicata*). Several times observed during the month of September.

12. PECTORAL SANDPIPER (*Pisobia maculata*). One specimen collected in a grassy slough a few miles south of the Saskatchewan.

13. BAIRD'S SANDPIPER (*Pisobia bairdi*). A specimen of this interesting little arctic sandpiper was collected in a grassy slough margin near "the Ridge" on September 1.

14. LESSER YELLOW-LEGS (*Totanus flavipes*). Large flocks observed on various sloughs. One collected at Laurier Lake September 1. Very common on muddy slough margins in the vicinity of "The Ridge".

15. KILLDEER PLOVER (*Oxyechus vociferus*). Common during September.

16. RUFFED GROUSE (*Bonasa umbellus*). Common about Laurier, Whitney, and Raft Lakes. To my surprise several individuals were seen frequenting isolated "bluffs" of small aspens on the open range. These had wandered from the thicker continuous woods on the Vermilion river.

17. SHARP-TAILED GROUSE (*Pediœcetes phasianellus*). Very common. During latter August and all of September, while the young were reaching their maturity, they were commonly found on the open prairie or grain fields. After the snow fall of October 7 and 8, which permanently remained, with thermometer in early November at 25-30 degrees below zero, the birds took up their winter quarters in good thick bluffs protected from cold winds by contiguous hills. These elevations, near their hibernal abodes, I am told, serve as their dancing grounds during the spring, summer and early fall.

18. TURKEY BUZZARD (*Cathartes aura*). The only note that I find in my journal referring to this species is under date of October 3, and reads: "A solitary buzzard sailed majestically towards the south this afternoon at a height of about 1000 feet. This is the only one of the species observed since arriving a Islay on August 27."

19. MARSH HAWK (*Circus hudsonicus*). Frequently observed during September.

20. AMERICAN GOSHAWK (*Astur atricapillus*) A large gray hawk flying over an area of snow-covered grain stooks on November 12, was identified as of this species.

21. SWAINSON'S HAWK (*Buteo swainsoni*). An adult specimen of this bird in dark plumage was collected on September 5. Previous to reading more carefully Mr. Taverner's *Birds of the Red Deer River, Alta.*, I felt assured that Swainson's Hawk was the only large hawk that I had been seeing. His fine series of skins however proved that differentiating "on the wing" between this and the Red-Tail is a doubtful proceeding. My journal reads throughout to the plenitude of Swainson's, some of which may have been *borealis*, despite the specimen collected on September 5, as a guide to the detection of the former.

22. PIGEON HAWK (*Falco columbarius*). Two individuals of this beautiful little hawk were noted during early September.

23. SPARROW HAWK (*Falco sparverius*). Not uncommon during September.

24. GREAT HORNED OWL (*Bubo virginianus*). Reported as a resident in the heavier woods along streams. During late fall both sub-species *pallescens* and *subarticus* would likely be found.

25. SNOWY OWL (*Nyctea nyctea*). An individual of this comparatively rare arctic bird was collected on October 10, following the snow-storm of the 7 and 8; when first seen it was sitting upright on a snow-covered stook, and with difficulty could it be determined whether it was really a bird or a turret of snow fashioned by the wind. It was rather wary when approached, but flew only short distances after taking to wing.

26. Flicker (*Colaptes auratus*) A common species during September.

27. Kingbird (*Tyrannus tyrannus*). But one individual noted, and that on August 30.

28. Horned Lark (*Otocoris leucolaema*)? My journal of September 13, reads: "Several times lately flocks of small birds have passed over-head, emitting soft twittering call notes identical with those of the eastern horned lark. I am convinced that these flocks are referable to the western variety of this species.

29. Blue Jay (*Cyanocitta cristata*). One example noted in the Vermilion Valley about September 15.

30. American Crow (*Corvus brachyrhynchos*). Quite common, large migrating companies passed south over the Twin Hills on September 30, October 1, 2 and 3.

31. Rusty Blackbird (*Euphagus carolinus*). Noted occasionally in early September, but large flocks were common from the 15th to the 18th of the month. Probably accompanied by a percentage of Brewers.

32. Western Meadow Lark (*Sturnella neglecta*). A very common bird of the prairies; still common on October 5, two days before the big snow storm. They then disappeared entirely.

33. White-winged Crossbill (*Loxia leucoptera.*) While tramping in a snowstorm on November 4 near a fringe of aspens skirting an alluvial lowland in the Vermilion valley, a solitary bird of this species came flying down the wind with the storm and lit in some aspens near by. I just managed to identify it in the driving snow when it was up and gone again.

34. Redpoll (*Acanthis linaria*). On October 19 the first redpolls of the season were seen in a small flock erratically flying about the railway grade where quantities of seed bearing weeds had attracted their attention.

35. American Goldfinch (*Astragalinus tristis*). Observed occasionally until the middle of September.

36. Snow Bunting (*Plectrophenax nivalis*). Commonly observed after October 15.

37. Smith Longspur (*Calcarius pictus*). While enjoying a ramble west of the town on September 27, a solitary individual of this species fluttered from the trail like a vesper sparrow, and alighted further along for concealment in an overhanging bunch of prairie grass. It permitted me again and again to approach very closely; each time it would flit along close to the ground, seek secret cover, and play the game again.

38. Vesper Sparrow (*Pœcetes gramineus*). Very common during September.

39. Savanna Sparrow (*Passerculus s. alaudinus*). A single specimen collected on September 19.

40. Savanna Tree Sparrow (*Spizella monticola*). Noted frequently after September 14 and up to November 1.

41. Slate-colored Junco (*Junco hyemalis*). First noted about the middle of September; common thereafter all fall, and still remaining in small flocks about the town in sheltered nooks on November 15.

42. Song Sparrow (*Melospiza melodia*). Observed in migrating flocks of mixed species about the willow margins of dried-up sloughs during early September.

43. Northern Shrike (*Lanius borealis*). Two individuals observed in early November.

44. Solitary Vireo (*Lanivireo solitarius*). A single individual was noted in a small aspen bluff on the prairie on the morning of October 1.

45. Myrtle Warbler (*Dendroica coronata*). Migrating in considerable numbers at Laurier Lake on September 1. The flocks were scattered about the low willow fringe, hedged in by the spruces on the east coast.

46. American Redstart (*Setophaga ruticilla*). A great movement among the warblers was one of the most conspicuous and interesting occurrences at Laurier and Whitney Lakes on September 1. This beautiful warbler in company with the former species seemed fairly to teem about the bushes.

47. American Pipit (*Anthus rubescens*). The first individuals of this species were noted on September 18. Not

being positive about the identity I was on the prairie the following morning at 5 a.m. to collect a cabinet specimen to make sure, and was surprised that no birds were to be seen. Their absence however was only apparent, for by 6 a.m. a few scattered individuals were in evidence and in the course of the next half hour, as the sun rose higher, flocks of hundreds appeared from the stubble. Individually they are not shy, but as a company they are very restless, rising erratically to wheel and dash in reckless abandon without apparent cause. A source of some surprise to me (with a ground-loving species) was their habit in one instance of alighting on telegraph wires which intersected the prairie.

48. BLACK-CAPPED CHICKADEE (*Penthestes atricapillus*). More common about the mixed woods in the vicinity of the lakes, but frequently seen in low willow-grown depressions on the prairie, far from large trees. Very common at Laurier Lake and Whitney Lake on September 1, in company with the warblers. Others noted in the vicinity of Island Lake.

49. OLIVE-BACKED THRUSH (*Hylocichla ustulata*). A specimen was collected September 1 at Laurier Lake. It was exceedingly wary, and considerable manoeuvring was necessary before the bird was obtained. It was vigilantly feeding about the tangled growth on the margin of the lake shore.

50. AMERICAN ROBIN (*Planesticus migratorius*). Very common throughout the fall. The last record was a solitary bird feeding in the snow near Pleasant Valley on October 10, two days after the big storm. No record since.

51. MOUNTAIN BLUEBIRD (*Sialia currucoides*). Rather uncommon; scattered individuals in widely separated localities noted during September. My last entry is on October 5, "Three mountain bluebirds observed near evening along the trail east of the Twin Hills."

(To be continued.)

CORRESPONDENCE.

Bird Migration.—Replying to Prof. A. B. Klugh's note in the September, 1920, number of the *Canadian Field-Naturalist* I wish to point out that I made no dogmatic statement regarding self-consciousness in animals. What I did say was that I thought there was no such thing, which is very different from positively asserting the fact.

What I meant and intended to convey by pure nature was life carrying on its functions untrammelled by man's influence or interference, when elaborate schemes are seen to work out with the utmost precision, the lepidopteron in the one case, and the bird in the other, making no preliminary experiments, and hence no mistakes, but carrying out through their subconscious minds those changes and acts which are necessary for the propagation and continuance of their respective races, which changes and acts are surely of the Infinite. Very little onus I imagine rests upon me to prove that millions of birds as well as other animals are every year making no mistakes in these matters. Of course it goes without saying that many lose their lives in carrying out these subconscious promptings. In the case of the bird, after having started on its journey it may be overtaken by a violent storm whilst crossing some large sheet of water and lose its life, but surely this and similar instances cannot be put down to the mistakes of the said creatures.

If, as Prof. Klugh says, there is absolutely no proof that any mind can communicate with any other mind save through the medium of the senses of hearing, sight, touch or smell, so likewise there is absolutely no proof that any mind cannot communicate with any other mind save through the above mediums. I personally much prefer to keep an open mind on the subject, believing that it may be possible for any one mind to communicate with any other mind irrespective of the aforementioned mediums.

I also do not see that it is so very hard to account for the fact that birds will

sometimes (not always by any means, for I have seen homing pigeons come home in one) become lost in a fog when migrating on the telaesthesia principle. Fog has a very depressing influence both physically and mentally, and why should it not therefore have the same effect upon subconscious perceptions, dulling and putting them out of commission for the time being, just as an electric storm affects the working of telephone, telegraph and wireless systems. In like manner I imagine the glare from a lighthouse on a dark night attracts the physical eye of the bird, drawing it out of its course and for the moment disrupting the psychological connection, which cannot be regained until normal conditions are re-established and the bewildered bird escapes from the light without losing its life, which so many do, thereby never reaching the land of which they had such a clear vision just before the physical faculty led to a disruption of the psychological connection, the same as the fog does or may do in the afore-mentioned case.

Speaking of bringing out latent faculties in animals, I once trained a British Goldfinch (*Carduelis carduelis britannica*) to perform some wonderful tricks, but no one will ever convince me that I was bringing out latent faculties already possessed by that bird. Rather would I suggest that dominant will power, as well as mesmeric influence, compelled that bird to perform acts which pure nature never intended it should, just in the same way as the lion tamer compels those noble animals to go through humiliating acts, which again pure nature never intended they should. Had they but self-conscious reasoning minds and knew their power I am afraid their tamer would soon be no more. It seems too sweeping a statement to say that no entirely new type of mental process such as reason can possibly be evolved by association with man, and I am still of the opinion that some of the higher animals from long association with man have, through his mental emanations, acquired some slight reasoning powers. It has been said that in such cases it is possible that the discarnate spirit of the animal does not return to the group-soul, but remains individualized.

To those who still hold to the theory that birds are possessed of reasoning powers I would suggest their reading Mr. C. W. Leister's experience with a Spotted Sandpiper, *Bird-Lore*, Vol. xxi, 1919, no. 5, pp. 287-289, wherein it is recorded how a Spotted Sandpiper (*Actitis macularia*), after her nest and eggs had been covered over, firstly with a cap, secondly with a leaf, thirdly with small sticks, and lastly with a stone, in every instance sat down on the top of the obstacle, and commenced incubating, surely a very foolish thing for a self-conscious and reasoning bird to do. In this instance I would suggest that subconscious mind brought her back time after time to the exact spot where the nest and eggs were, but that lack of self-conscious or reasoning mind allowed her to sit on the obstacles without ever investigating or removing them, which was perfectly feasible in cases two and three, and even in the first was not impossible. However, *chacun a son goût*, which also applies to the answers to the following questions, which appear to me to require more than the hearing, sight, touch or smell theory to explain them, viz:—

1.—How is it that a string of swallows, gathered on a telegraph wire are able to leave it at one and the same instant?

2.—How do a flock of shorebirds manage to turn and twist at one and the same moment, thereby avoiding collision with one another?

3.—How do a pair of birds manage to work in harmony whilst constructing a nest?

4.—How does a bird when flushed from its nest on the darkest night yet find its way back?

5.—How does the larva, devoid of physical sight, yet manage to find its way from the food plant to the necessary pupating station, which may be hundreds of yards from the former?

I would suggest that telepathy (mind blending) answers Nos. 1, 2 and 3 in a nutshell, and likewise telaesthesia (the power of vision passing the limits of time and space) the two last. That I am not alone in discarding the sight or landmarks theory seems evident from an article in the October, 1920, number of the *Ibis*, which article was briefly reviewed in the January,

1921, number of the *Auk*, p. 147, the reviewer there stating that he heartily agreed with the views of the author, i.e. that birds do not rely to any large extent on landmarks to guide them on migration. However, we are all at liberty to hold our own views on these very interesting, but intricate, matters and having now clearly stated mine, it is not my intention to pursue the subject further, seeing that it is given to none of us to prove absolutely what we may personally believe to be the answers to them all. The solution, like that to the life hereafter, it is not permitted us to see.

H. MOUSLEY, Hatley, Que..

PROSECUTIONS.

MIGRATORY BIRDS CONVENTION ACT AND NORTH-WEST GAME ACT BY OFFICERS OF THE DOMINION PARKS BRANCH AND ROYAL CANADIAN MOUNTED POLICE.

Migratory Birds Convention Act. Feb- 1921 *and May* 19, 1921.

Percy McGray, Clarke's Harbour, N. S., killing a Murre. Specimen and gun forfeited. Fine $10.00 and costs.

C. Harmston, Courtenay, B.C., shooting Sea Gull. Gun and Gull forfeited. Fine $10.00 and costs.

Maurice Smith, Clarke's Harbour, N. S., possession of Eider Ducks. Dismissed.

Wm. Chapman, Jr., Dartmouth, N.S., shooting at a Murre. Fine $10.00 and costs.

Leonie Allen, Petit de Grat, N.S., shooting Merganser in close season. Fine $10.00 and costs.

Lochart Lohnes, Garden Lotis, N.S., killing a Duck in close season. Fine $25.00 and costs.

Harper Allen, West Bathurst, N. B., Selling Geese. Fine $3.00. Suspended.

Peter Pineau, Rustico, P.E.I., killing a Goose between the hours of sunset and sunrise. Fine $10.00 and costs.

Stephen Heisler, Martin's River, N.S., killing a Duck in close season. Fine $10.00 and costs.

Stanfords, Ltd., 128 Mansfield St., Montreal, P.Q.; Henry Gatehouse and Son, Bonsecours Market, Montreal, P.Q.; P. Poulin and Co., Bonsecours Market, Montreal, P.Q.; Walter Deery and Co., Bonsecours Market, Montreal, P.Q.; J. P. O'Connor, St. Antoine Market, Montreal, P.Q.; possession of Migratory Game Birds. Withdrawn.

Percival Allmond, Hamilton, Ont., shooting a Robin. Fine $10.00 and costs.

Juvenile, Britannia, Ont., molesting Canada Goose in close season. Suspended sentence and costs.

Robert Readman, Fort Francis, Ont. engaged in business of taxidermist without securing a license. Fine $10.00 and costs.

John Jackson, Murray Harbour, P.E. I, shooting Canada Goose in close season. Fine $10.00 and costs.

Sylvere Gallant, St. John's Road, Muddy Creek, P.E.I., Possession of a Duck in close season. Fine $10.00 and costs.

Lloyd Heisler, Indian Point, Lunenburg Co., N. S., Shooting Ducks in close season. Fine $10.00 and costs.

W. O. Bowser, Amherst, N.S., Molesting Ducks in close season. Fine $25.00 and costs.

Artemus Davidson, Tindal Road, Amherst, N.S., molesting Ducks in close season. Fine $50.00 and costs.

Enzor Oulton, Tormentine, N.B., killing or molesting Wild Geese in close season. "Goose-boat" seized and forfeited. Dismissed.

The Game Conservation Board of British Columbia has furnished the Dominion Parks Branch with a summary of prosecutions, from January 1, 1921, to May 9, 1921, under the British Columbia Game Act, which amount to violations of the Migratory Birds Convention Act:—

J. Antipas, Hunting Ducks in close season. Fine $10.00

H. Crawford, Hunting Ducks in close season. Fine $10.00

T. Leathem, Hunting Ducks in close season. Fine $10.00.

Shing Chong, Mallard Ducks in shop for sale. Fine $10.00.

Sam Lee, Mallard Ducks in shop for sale, Fine $10.00.

G. A. Sharp, Mallard Ducks in shop for sale. Fine $10.00.

Wong Wee, Did buy a Mallard Duck. Fine $10.00.

Northwest Game Act Prosecutions.

A. Adams, Little Buffalo River, N. W. T. Trapping without a license. Two mink skins seized. Fine $5.00.

NOTES AND OBSERVATIONS.

NOTES AND OBSERVATIONS ON THE WHITE-WINGED CROSSBILL.

— In many ways the past winter was a remarkable season. Snow covered the ground on the 13th of November, and although we had exceptionally mild weather with intermittent rains and no prolonged snow-falls, yet the temperature was consistently even and sufficiently low to keep the ground snow-covered until early March. On the 13th of March the fields about Montreal were practically bare and I was a little doubtful about undertaking a previously arranged snowshoe tramp with my friend, Mr. W. J. Brown. However, armed with very large snowshoes and proportionately large 'boeufs', I ran the gauntlet of interrogative glances and was glad to reach the station and further company. Snowshoeing on bare ground is not a conventional sport. Reaching Ile Jesus, adjacent to Montreal Island, conditions were reversed and bare spots the exception; while throughout a large spruce forest, twenty-five miles farther north, the snow was between two and three feet in depth.

Earlier in the morning, at St. Lambert, I had seen a few Robins, Song Sparrows and Bluebirds; but here were no cheery greetings from spring arrivals, although I saw a Marsh Hawk and a Red-shouldered Hawk, and glimpsed a furtive sparrow in the spruce undergrowth that I failed to identify. On the other hand here was a probable part explanation of the dearth of birds about urban districts during the past winter. Black-capped Chickadees were fairly common — about twenty-five being noted in two flocks. During former winters I almost invariably saw this bird on all of my walks in the vicinity of Montreal. I always counted on seeing at least the Chickadee until the past Winter, when I seldom saw it and then in greatly reduced numbers. In these spruce woods (mainly Black Spruce and Tamarack) one Canada Jay was seen, an Arctic Three-toed Woodpecker and four or five Red-breasted Nuthatches, but the most noticeable birds were Pine Siskins and White-winged Crossbills.

The Siskins were well distributed in small groups and pairs (?) and many were heard singing. Probably twenty-five were noted.

The Crossbills were also distributed in small groups but their erratic movements made it difficult to determine their numbers. All those that were plainly seen were males. Several were heard singing from spruce tops and one gave a remarkable flight-song — just skimming the tops of the conifers on fluttering wings, while giving a series of trilled songs continued throughout a flight of about one hundred yards, when the singer pitched into a spruce tree. Following, I found it feeding in the tip of a Black Spruce with two other males.

One song, or flight-note, that was heard several times, recalled the tremulous twitter of the Snow Bunting so strongly that I was at first inclined thus to record it. On March 27th we revisited this locality, minus our snowshoes, but found still a good two feet of snow in most places and progress was laborious. Although two flocks of ten and twenty White-winged Crossbills were seen feeding on tamarack seeds, and other birds were heard in flight, we were un-

able to determine whether they had commenced nesting or not.

On April 3rd practically the same ground was covered and although one Crossbill was heard in flight, none were seen.

It is noteworthy that this species appears to be the prevalent crossbill in the Montreal district, at least during recent years; while in Compton County, during the years 1899-1902, and at other times, I did not record it at all, but found the Red Crossbill a common bird.

L. McI. TERRELL.

OBSERVATIONS ON THE BIRDS OF PRINCE EDWARD ISLAND.

During the month of June and the first few days of July, I was engaged in marine biological work at Malpeque, P.E.I. I was able incidentally to make a few observations on the birds of the region and these are worth putting on record only because very little has been published concerning the avifauna of Prince Edward Island.

The country round Malpeque Bay, which is also known as Richmond Bay, is practically all cleared. Here and there small patches of White Spruce and Paper Birch remain, and on the north side of nearly every house is a wind-break of these same trees left as a protection against the bitter north winds which sweep in from the Gulf of St. Lawrence. Curtain Island, near the middle of Malpeque Bay, and some of the other islands in the bay, are fairly well timbered.

The chief feature of the avifauna as a whole which impresses one is that it is not particularly rich in species, but that there are a great number of individuals of such species as do occur.

On the bay and on the outer coast the commonest birds are the Common Tern and the Herring Gull. On Fish Island, and on its great barrier dunes which extend practically across the mouth of the bay, the Piping Plover is very common, and its melodious yet somewhat plaintive note seemed to fit in most appropriately with the vast gray expanse of the dunes and the roar of the surf.

The Belted Kingfisher is not uncommon and a pair had their home in a burrow in a high eroding cliff on Curtain Island.

The Ruby-throated Hummingbird is fairly common and a pair nested in the orchard beside the North Shore House at which we stayed.

Of the Woodpeckers the Flicker and the Yellow-bellied Sapsucker are the commonest species, the former being abundant and nesting in the old spruce stubs which in many places are found along the fences.

The Kingbird, the Olive-sided and the Least were the only Fly-catchers observed. About a quarter of a mile from the North Shore House there is a little patch of spruce, and from the top of one of the tallest of these trees an Olive-sided Flycatcher uttered his "Whip-whee-yoo-u-u" from morning till night, and this clear ringing note reached us with its volume but little diminished. He also had a softer "*Quilp-quilp*" which he used occasionally. A Least Fly-catcher, which nested in the grounds, was the most persistent singer of all the birds of the neighbourhood. His chief haunt was in one of the tall willows, and here he sat and uttered his "*Chebec-chebec-chebec-chebec-chebec-chebec*" so continuously that one wondered when he found time to eat. On two or three occasions I saw him describe an arc in the air, and while doing so he sang a song quite unlike, and far more melodious than, his usual monotonous vocal performance.

The Prairie Horned Lark is common in the fields. The Crow is abundant both in the fields and on the shore. The Bronzed Grackle is one of the most abundant birds of the whole region about the bay, and nearly every patch of spruce held a large colony of these birds. The status of this species on the Island seems to have changed since Macoun in 1888 wrote "One pair seen at Tracadie", and Dwight in the nineties said "A pair of these birds in Mr. Earle's possession were the only ones he had ever seen on Prince Edward Island."

The Purple Finch is a common summer resident, and a male which lived in the vicinity of the North Shore House was the most brilliant songster of this species I have ever heard, his rich warbling re-

frain being deep in tone and long-continued.

The Vesper Sparrow is extremely common, but is exceeded in numbers by the Savanna Sparrow which is the most abundant bird of the region. The White-throated Sparrow is common in such pieces of woodland as are left, this being particularly the case in a damp piece of forest near Kensington and in the woods on Curtain Island. The Song Sparrow is common, the Chipping Sparrow rather scarce, and the Slate-coloured Junco abundant.

Of the Swallows, the Tree Swallow is the most abundant species, though the Barn and the Cliff Swallows are common and many colonies of Bank Swallows nest in the soil at the top of the cliffs on Curtain Island and at other points along the coast.

The commonest species of Warblers are the Myrtle, Magnolia, Yellow and American Redstart. A pair of Myrtles lived in the wind-break in front of the North Shore House and the male was a continuous singer. A pair of Yellow Warblers had their nest in a gooseberry bush in the garden. It was composed of dried grass, pieces of twine and yarn, and bits of birch-bark, and lined with hair and a few chicken feathers. When the female was hunting material for her nest she frequented the lawn and readily accepted donations in the shape of yarn or twine. When she was seeking hairs with which to line the nest, she seemed to find the verandah the most promising hunting-ground, and finding a hair caught in a crevice, or on a splinter, she pulled at it, now from this direction, now from that, swinging round and round as she tugged, and usually succeeding in dislodging it. The male took no part in the construction of the nest, nor in incubation, but brought insects to the female while she was sitting. Three of the four eggs hatched and the shells and the unhatched egg were removed from the nest. For the first two days after the young appeared the female spent most of her time brooding, while the male was busy foraging. As he approached the nest he invariably sang, and when the female heard him she usually slipped from the nest and went off to secure a few insects, sometimes for herself, sometimes to give to the nestlings on her return, while the male fed the nestlings. In the early days of feeding whole insects were not given to the young, but the insects were pounded and swallowed by the male, then regurgitated into the throats of the nestlings.

The Maryland Yellowthroat and the Canadian Warbler were seen only in the woods on Curtain Island.

The Chickadee and the Acadian Chickadee are about equally common in the pieces of woodland.

The Hermit Thrush and the Olive-backed Thrush were observed in the woods on Curtain Island and were heard singing from the woods on some of the other islands.

The Robin is abundant, and three pairs nested in the grounds on the North Shore House. The songs of the three males differed considerably in quality, and one of them had a most characteristic refrain in which the syllables "*Rip-rip-ter-rrurr*" occurred very conspicuously and with great frequency.

A. BROOKER KLUGH.

PRAIRIE WARBLER AT HAMILTON, ONT.

On going into the garden on the morning of May 12, 1920, to look for migrating birds, I noticed an unfamiliar Wood Warbler feeding in a thicket of wild plum trees. I observed it carefully for several minutes at a distance of about twenty-five feet, with bright sunlight behind me, using 6 X field-glasses. As the bird was moving away, I was unable to get a good view of the head or under-parts, but could see that they were bright yellow marked with black. Observation of the upper-parts was very satisfactory, however, and I noted a reddish, saddle-shaped area on the back, which was olive-green. On consulting P. A. Taverner's "Birds of Eastern Canada", I identified the bird as a Prairie Warbler (*Dendroica discolor*). I knew that the bird was not a common one; but not until recent conversation with Messrs. W. E. Saunders and H. F. Lewis did I realize that it is rare enough to

make this record of possible interest to other observers.

The thicket in which this bird was seen runs through two gardens and some adjoining vacant-building-land on "The Mountain" and about three hundred yards south of its edge. The neighborhood is a very quiet one; and the thicket is a favorite haunt for migrating birds. Only the Yellow Warbler, of this family, was noticed there before the Prairie Warbler in 1920; and no others were recorded until several days later.

R. OWEN MERRIMAN.

BOHEMIAN WAXWINGS IN SASKATCHEWAN.

On April 1st (1921) I saw a very interesting and to me a new sight. When I say I saw a flock of one thousand Bohemian waxwings, I feel confident that I could multiply that number by three and still be within the mark. This was in River park (Regina). There were acres of them, feeding on the bushes and shrubs of the park. They would take wing, circle, and again alight, and as they rose there was a roaring sound from their wings. They flew from bush to bush and passed within ten feet of me quite unafraid. I was surprised to see not a few of them with a white spot the size of a five cent piece at the side of the neck, just in front of the wing at the shoulder. It was a beautiful sight to see a tree literally covered with hundreds of these birds, the branches bending under their weight. I have not heard of their having been seen in such large flocks before.

NEIL GILMOUR, Moose Jaw, Sask.

APPOINTMENTS. — In November, 1920, Mr. Harrison F. Lewis, of Bergerville, Quebec, and Mr. J. A. Munro, of Okanagan Landing, B.C., were appointed Chief Federal Migratory Bird Officers for Ontario and Quebec, and for the Western Provinces, respectively, Mr. R. W. Tufts, of Wolfville, Nova Scotia, was appointed to a similar position for the Maritime Provinces in 1919. All three have brought to their new positions that prime requisite, a thorough knowledge of ornithology, and great advances in the cause of bird protection in Canada may confidently be expected as a result of their efforts.

H. L.

THE CANADIAN FIELD-NATURALIST

VOL. XXXV. GARDENVALE, QUE., APRIL, 1921 No. 4.

A POPULAR DESCRIPTION OF DINOSAURS.

By C. M. Sternberg.

Introduction. — Palaeontology deals with the history of life, and its time is measured in millions of years rather than centuries as civilization is measured. The time that civilized man has ruled the earth is to the time that life has been upon it, as a day is to the average life of a man.

In the remote past many orders of reptiles and other animals flourished during their time, then passed away, in many cases leaving no descendants. Were it not for the fact that many of these ancient animals left their bones entombed in the rock that was laid down at the time when they lived, we would know nothing about the animals that inhabited the earth in past geological ages.

Among the most interesting and remarkable of these animals were the dinosaurs which were so abundant during the Mesozoic Era.

General Discussion.—The name Dinosaur is taken from the Greek and means Terrible Lizard. It was first proposed by Professor Owen, the eminent English palaeontologist and anatomist. The dinosaurs were an order of reptiles comprising the largest land animals of which we have any knowledge, and in most classifications of the animal kingdom hold the same rank as the *Chelonia* (tortoises and turtles) and *Squamata* (lizards, snakes, etc.). They were the dominant type of land animals during the *Mesozoic* period or Age of Reptiles, which lasted some millions of years and closed at least three million years ago. They were widely distributed, their bones having been found on each of the six continents, although North America has yielded by far the greatest number of genera and complete specimens.

The dinosaurs varied greatly in size, structure and habits, but all of them are noted for their small and primitive brain. While some of the amphibious forms, of Jurassic age, attained a length of one hundred feet, others were very small, *Compsoganthus*, a carnivore of Jurassic age, being only two feet in length. The small carnivora were very slender and without doubt were fleet-footed and active. The armored forms were heavy-boned, clumsy, slow-moving creatures. Some forms must have taken to the water for defence, while others were provided with horns, and yet others were completely incased in dermal armor or plates of bone in the skin. They all possessed four limbs, though in some the front pair were very small. None of the dinosaurs had the power of flight so far as known, though a contemporary order of reptiles, the *Pterodactyles*, must have been as graceful flyers as our present-day bats. The amphibious forms (*Sauropoda*) must have spent much of their time in the water. Some students believe that they never left the water, though of course like all reptiles they were compelled to keep the nose above water to breathe. In this sub-order are placed *Gigantosaurus*, *Brontosaurus*, *Diplodocus*, etc.

Certain of the carnivorous forms were so bird-like that, where only part of the skeleton was known, they have been called birds. Because of the great similarity between these forms and certain birds, some students believe that in the course of evolution, the birds evolved through the dinosaurs, while others believe that both birds and dinosaurs were derived from a common ancestor. The similarity of certain dinosaurs to birds is most no-

ticeable in the pelvis, or bony arch with which the hind limbs articulate, and the hollowness of the bones, especially those of the limbs.

The largest of the carnivorous forms, which attained a length of forty feet, has been named *Tyrannosaurus* or Tyrant Lizard, and quite deserves the name *Dinosaur*.

People often say "What strange animals lived in prehistoric times", but they do not think of the strangeness of some of our present day animals because they are familiar with them. They remind one of the small boy who, when visiting the Zoo for the first time, gazed intently at the giraffe for a few moments, then turned to his mother and said, "There aint no such animal."

THE CANADIAN FIELD. — Our Canadian field, on the Red Deer River, Alberta, is probably the richest known for the collection of dinosaurian remains, if we consider the number of genera and species it has produced and the completeness of the specimens. Though we have made great advances in our knowledge of the upper Cretaceous dinosaurs, there are several species which, as yet, are represented by such fragmentary material that only insufficient knowledge of their structure can be gained.

There are two subdivisions of the upper Cretaceous, known as the Edmonton and Belly River formations respectively from which Geological Survey field parties have collected most of the dinosaurian remains now preserved in the Victoria Memorial Museum at Ottawa. The Edmonton formation is best exposed along the Red Deer river northeast of Calgary, Alberta, while the most productive deposits of Belly River age are exposed along the same river east of Calgary. These and rising several times. What is now two divisions are separated by about six hundred feet of marine deposit (Ft. Pierre), showing that at the close of the Belly River age this region was submerged beneath the sea and did not reappear until Edmonton time.

There is much evidence to show that during Cretaceous times the continent was not stable but sank in one area and rose in another, and repeated the sinking Alberta was submerged beneath the Cretaceous sea no less than three times. The close of the Cretaceous period marked the draining off of the Cretaceous sea and the country continued to rise until it reached an altitude of thirty-five hundred feet above sea level. Subsequently most of the deposits which were of more recent age than Cretaceous were eroded away, and finally the great ice cap aided in the leveling by scouring here and filling there. Only a remnant of the more recent deposits is left on the high points which did not succumb to the levelling e. g. the Hand Hills and the Cypress Hills.

Since the glacial period the Red Deer river has cut a great trough in the prairie and has tapped the ancient burial ground. The erosion has been so rapid that the banks are quite steep, and the rocks are denuded of soil or vegetation and in many places are weathered into a badland topography of many canyons, ridges and steep slopes. In these badlands Geological Survey parties search out the ancient giants and remove them to Ottawa, there to be preserved for all to see and study.

At the time when the Belly River and Edmonton deposits were being laid down this section of country was a great low-lying land of many lakes, bayous and swamps, which were very little above the level of the Cretaceous sea. This sea extended from the Gulf of Mexico over what is now the prairie states and provinces and at one stage connected with the Arctic Ocean, thus separating the western part of the continent from the eastern part.

That the dinosaurs lived near sea level is proved by the fact that we often find mingled with their bones, the bones of marine animals which had wandered too far inland or whose bones had been driven in by the waves. Most of the deposits in which the remains are found are of fine grained sand and clay which indicates sluggish streams or quiet water.

Evidence points to a dense growth of both land and water plants. Rushes are very common, as are trunks, branches, and cones of the Red Wood. The presence of palms, figs, and other forms of

similar habitat indicates that the climate was semi-tropical.

This must have been a much favoured haunt of dinosaurs and other reptiles, for there are thousands of individuals represented and of course we see only a very small percentage of the bones that were entombed in the rocks.

As the animals died on the banks of a river or lake or on a delta, the flesh was torn off by some hungry carnivore and the bones scattered. In times of flood these bones were picked up and carried to some lake or washed upon a mud-flat or sand-bar. There are a great many extensive "bone beds" or layers in which thousands of bones have been deposited, as driftwood would be thrown up on a beach by the waves, or carried on to a mud-flat by back water. These bone beds are usually at the junction of the clay and sand rather than wholly within either type of deposit. The bones in these deposits are usually disarticulated and show signs of having been tossed about by the waves.

Besides these bone beds many skulls and skeletons were deposited more or less complete. Some of these seem to have been washed upon a beach or mud-flat and after the lower half was covered with sediment the exposed portion was torn away by some carnivore leaving only half of the skeleton to be preserved. In other cases the animals were mired or the carcases were washed into quicksand or on to mud-flats where the carnivora could not reach them. One skeleton collected shows the remains of rushes which grew among the undisturbed bones and even the skin impression is preserved. It is very common to find skeletons mingled with the remains of vegetation such as rushes, moss, leaves and branches of trees. The animals which spent most of their time in the water are better known than those which habitually lived on land, because after death their bodies often floated into some lake or bayou beyond the reach of the carnivora, and were buried intact.

KINDS OF CANADIAN DINOSAURS. — Of the dinosaurs that have left their bones entombed in the Belly River and Edmonton formations along Red Deer river, Alberta, the best known are divided into four families. The most common is that of the duckbilled dinosaurs or *Hadrosauridae*. Of this family nine genera have been collected from Alberta, eight of which have not been found in other deposits. Next in number comes the family of horned dinosaurs or *Ceratopsia* of which two genera have been described from the Edmonton and five from the Belly River formations. None of these are known from any other age. The armored dinosaurs or *Ankylosauridae* are not as well known as the above-mentioned families. The carnivorous dinosaurs belong to a different sub-order. They do not possess a predentary (a bone situated in front of the dentary or lower jaw) as do the above-mentioned families. None of the very large or very small dinosaurs have been found in these deposits. They have been found only in older deposits than those represented on the Red Deer river.

The duck-billed dinosaurs were heavy-boned creatures which ranged up to forty feet in length. The legs were of unequal size, the hind pair being the larger. The fore-feet had four toes and the hind ones three. The terminal phalanges of the toes of the hind feet and part of those of the front feet bore hoofs. All four feet were webbed. The tail, which comprised about half the length of the animal, was high and narrow, making a powerful swimming organ. The integument was made up of small scales, (non-imbricating and polygonal) which were little thicker than the scales of a snake. At certain intervals there were areas of larger scales or raised bosses which varied in shape and arrangement in different species. It is probable that with this varied skin pattern there was a varied color pattern which may have been quite ornamental. The thin skin and absence of any means of defence, coupled with the webbed feet and swimming tail, seem to prove beyond a doubt that these dinosaurs spent most of their time in the water or at least took to the water for protection from their enemies. The premaxillae and predentaries were expanded and incased in a horny sheath similar

to the bill of a duck, hence the name "duck-billed".

These dinosaurs were purely herbivorous as shown by their teeth. The teeth were arranged in a magazine in vertical as well as horizontal rows. There were more than twelve hundred teeth in the four jaws but only about one in five of these was in use at a time, as there were five or more teeth in each vertical row. As the teeth became worn they were pushed out and replaced by new ones which were ever forming at the base of the magazine. In this respect they differ from the mammals which have only two sets of teeth. The cutting surface of the teeth was on the inside in the case of the upper jaw and on the outside in the lower jaw. The lower jaws passed within the upper jaws and the teeth worked like a pair of shears in cutting the soft vegetation after it had been nipped off with the expanded beak. The duck-billed dinosaurs ranged over much of North America during late Cretaceous times.

The horned dinosaurs were quadrupedal land animals with short massive limbs. There were five toes on each front foot and four functional and one vestigial toe on each hind foot. In general build of the limbs and feet they somewhat resembled the rhinoceros.

These animals had the largest heads of any land animal known. In the case of one (*Chasmosaurus belli* Lambe) the skull covered half the length from the snout to the drop of the tail, measuring five and one half feet. Triceratops skulls, (from a more recent formation) have been recorded up to nine feet in length. These huge skulls were solidly constructed and were surmounted by three horns one over each eye and one over the nose.

In some cases the nasal horn was greatly developed at the expense of the supra-orbital horns, while in other genera the reverse was true. The back of the skull was developed into a large crest or shield which extended over the neck and shoulders. This crest helped to give the skull its huge proportions and with the horns must have been a formidable means of defence. The snout was developed into a sharp cutting beak incased in a horny sheath, similar to that of a parrot but many times as large. This beak was probably used for cutting off the vegetation on which the animal fed. The horned dinosaurs had the distinction of being the only reptiles which had double rooted teeth. The teeth were arranged in magazines somewhat similar to the teeth of the duck-billed dinosaurs, but fewer in number. They show that the animal was herbivorous in habit. The tail was shorter and more nearly round than in the before-mentioned family and shows no adaptations for life in the water. The skin of the horned dinosaurs was made up of non-imbricating polygonal scales which were larger and somewhat thicker than those of the duck-billed family. Some of the largest scales were two inches in diameter. The first horned dinosaur skin impression brought to light was that described by the late Mr. L. M. Lambe in the *Ottawa Naturalist* for January, 1914.

It is probable that these animals were gregarious in habit, as the writer has observed a number of deposits of bones in which only horned dinosaurs were represented and seemingly only one genus in each case. This would seem to indicate that they assembled in certain swampy or low-lying areas from which other animals were excluded.

Skulls of this family are much more common than skeletons. This may be explained by the fact that they lived and died out of the water, and as the skull, which was solidly constructed, was more durable than the rest of the skeleton, it may have lain on the banks for months before it was picked up by some flood which carried it for miles. Thus the skull would remain intact while the rest of the skeleton woul be widely scattered. The reverse of this situation is true in the case of the water-inhabitating duck-billed creatures whose skulls were more fragile and seem to have been easily detached from the body and destroyed. In the Belly River formation it is common to find skeletons of the duck-billed dinosaurs without the head. This seems to prove that the neck was weak and allowed the head to drop off as the car-

case floated about before reaching its final resting-place.

The third family of herbivorous dinosaurs found in the deposits along the Red Deer river is the armored or plated dinosaurs. They were low, heavy-boned, quadrupedal, land animals with very short massive limbs. The feet were short and stubby and somewhat resembled the feet of a rhinoceros. The ribs were so constructed and articulated as to throw them well out and give a broad back and a large body cavity much the shape of a huge barrel. The hips were as much as five feet broad though the animal was not more than six feet high.

These dinosaurs were completely incased in dermal armor or bony scutes in the skin. In some genera the scutes were high-keeled, thick and as much as a foot and a half in length, while in other genera they were more plate-like with only slightly elevated keels. The larger scutes were arranged in rows along the back and sides while on the under parts were ossicles of irregular shape which protected the animal much as the chain armor protected the warrior of the middle ages. Between the large scutes were smaller ones and in the smaller intervening spaces were tiny ossicles similar to those on the under parts. It is quite evident that these creatures were so effectively armored that they need have no fear of their enemies. The tail terminated in a bony club, about the size of a water pail, which was made up of a number of modified dermal scutes thoroughly fused together. The eyes were protected by a bony lid, and in at least one genus (*Panoplosaurus*) even the mouth was protected by a plate of bone in the cheek, which Mr. Lambe has called the dental plate. The members of this family also possessed a horny beak. These animals were so well protected that they did not need speed as a means of escape and so became a heavy sluggish animal in which the main development was strength to carry the heavy load.

The armored dinosaurs had an exceptionally small brain, the cavity being smaller than a man's fist. The neural canal was greatly expanded within the sacrum, and Prof. Marsh thought that this was the seat of that part of the brain which controlled the action of the animal.

There are at leat four genera of carnivorous dinosaurs represented in these rocks, the largest of which is *Gorgosaurus*. While *Gorgosaurus* attained a length of thirty feet there was a contemporaneous carnivore which was probably not more than eight or ten feet long. Only fragments of the latter have been found and it has not been described.

Gorgosaurus had a much lighter frame than the herbivorous forms and the limb bones were hollow. The bones show many well-developed areas for the attachment of muscles. No doubt *Gorgosaurus* was much more active than the herbivorous forms, but of course was too heavy to be agile. The smaller forms were probably much more active.

The carnivorous forms walked on their hind feet only, and used their huge tails as balancing organs. The front limbs were very small, specially in *Gorgosaurus*, and could have been of little use. This limb was becoming vestigial as shown by the study of earlier carnivorous dinosaurs. The fore-limb possessed only two functional digits and one metacarpal which was vestigial, while the hind foot had three well developed and powerful toes and a smaller one at the back similar to the back toe of a turkey. The fifth toe was represented by the proximal part of the metatarsal. The terminal phalanges each bore a powerful claw. *Gorgosaurus* had four powerful jaws in which were more than sixty sharp, double-edged, recurved teeth, some of which were four inches long. It must have been a fierce looking lizard as the name implies.

Mr. L. M. Lambe suggested that *Gorgosaurus* may have been a scavenger, since the teeth of the type specimen showed no sign of wear.

Another fairly well-known genus is *Ornithominus* which was much smaller and of more slender construction than *Gorgosaurus*.

The carnivorous dinosaurs were not fitted for life in the water.

Extinction.—It is impossible to say what caused the exermination of the dinosaurs. Changing conditions with the cutting off of their food supply and their inability to migrate great distances may have been one cause. The rise of the mammals with their

more highly developed brain may have put the huge stupid dinosaurs to a disadvantage in the contest for subsistence. In the most recent formation from which dinosaurian remains have been collected, (the Lance formation) there are only a few genera represented, which seems to point to the gradual rather than sudden extermination of the order. Certain families of turtles, crocodiles and fishes which existed with the later dinosaurs have persisted to the present day with very little change. That the dinosaurs evolved very rapidly is shown by the fact that with few exceptions a genus did not persist from one geological subdivision to another. For example in the Edmonton formation, which is separated from the Belly River formation by about six hundred feet of marine shales, we do not find the same genera that are found in the Belly River formation, though in several cases the line of descent is quite apparent. Geologically speaking these formations are quite close together in time.

A CYPRINID NEW TO SCIENCE.

By PHILIP COX, PH.D., UNIVERSITY OF NEW BRUNSWICK.

This minnow (*Leuciscus rubrilateralis* Cox) was discovered by the writer in the summer of 1897 while he was investigating the fresh-water fishes of the peninsula of Gaspé, P.Q. It was generally associated with *Conesius plumbeus* Agassiz, but in some of the rivers, i.e. Nouvelle and Grand Pabos, it was the dominant form. At that time the fish was diagnosed as the eastern representative of *C. dissimilis* Girard, or a variety of *C. plumbeus*; and, as the latter, was reported to the Royal Society of Canada (Fresh Water Fishes and Batrachia of the Peninsula of Gaspé and their Distribution in the Maritime Provinces of Canada, by Philip Cox, Ph.D., *Trans. Royal Soc. Can.*, Vol. V, Sect. IV, p. 148, 1899).

A subsequent and more critical study of the few specimens preserved seemed to confirm that view, and it was published as *C. p. rubrilateralis* Cox (Cyprinidae of Eastern Canada, *Bull. No.* II., *Proc. Nat. Hist. Ass.*, Miramichi, 1901, p. 42).

In August, 1918, numerous specimens of this minnow were taken by the writer in Black Brook, Loggieville, Miramichi, N. B., and carefully diagnosed, when the two most important characters, namely, the dental formula and the presence or absence of the barbel were more satisfactorily determined from the examination of a large quantity of fresh material. It was then seen that its affinities were with the genus *Leuciscus* rather than with *Conesius*, and that it was entitled to full specific rank.

The Gaspé fish are small, rarely exceeding four inches in length, but, like all the cyprinids of the peninsula, are brillantly colored, the males well deserving the name "redfish", by which this species is known locally in Loggieville. The Miramichi Redfish are much larger, often attaining a length of six inches, but the coloration is dull, except in the breeding season, when the rosy hues are intense on the males but only perceptible on the females.

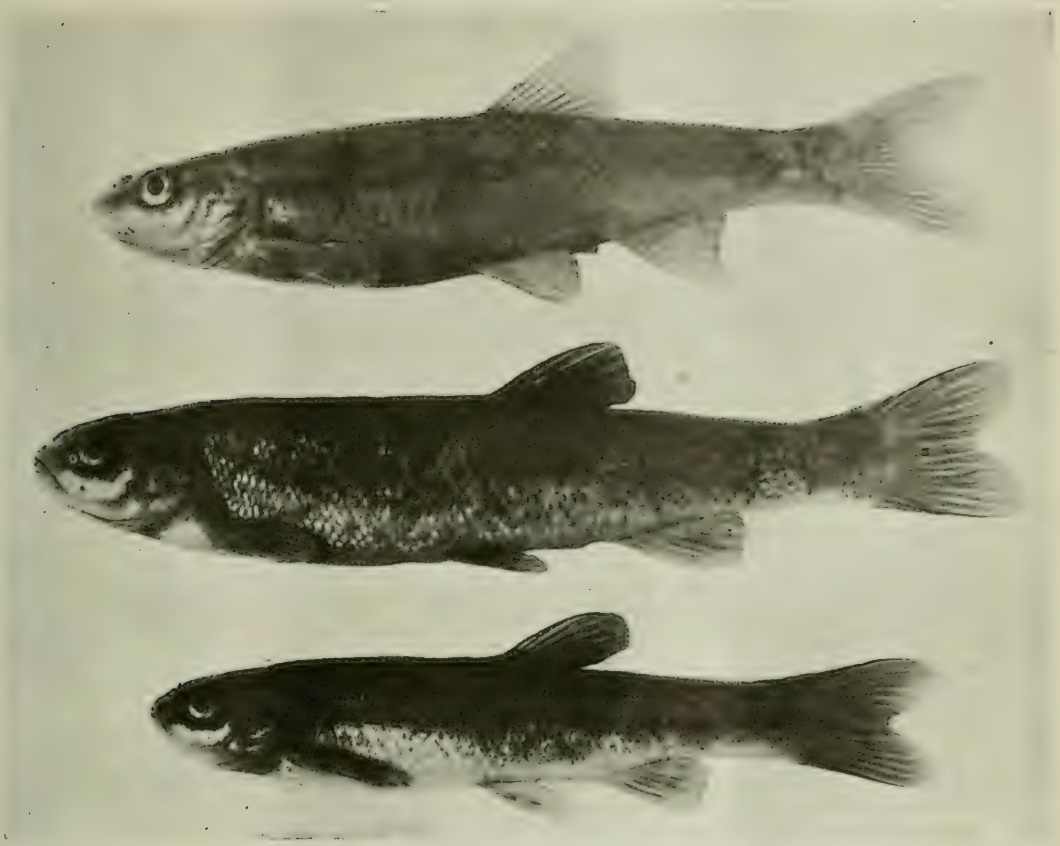
The accompanying plate shows an example of *C. plumbeus* above, and two Black Brook specimens of *L. rubrilateralis*, a female, and a male, below.

The type may be described as follows:—

Body robust, cylindrical, head and caudal peduncle slightly compressed; dorsal curvature less than ventral.

Head 4½-4¾; depth 5; snout 4-1/3 in head; eye small, 5 in head, 1-1/3 in snout; D. 8, A. 8; scales 12-72-8 or 9.

Head short, rounded above; snout, bluntish; mouth small, oblique, lower jaw included; maxillary not reaching the orbit;



Conesius plumbeus (above) and two specimens, one male and the other female, of Leuciscus rubrilateralis.

barbel not evident. Teeth 2.5-4.2 normally, but number often reduced, frequently by absorption, hooked and without grinding surface.

Fins small, rounded; dorsal inserted well behind the ventrals, the tip, when depressed, over middle of base of anal; anal smaller than dorsal and of same shape; ventrals small, reaching nearly to vent in males, not so far in females; pectorals inserted low, and reaching half way to ventrals. Scales small, a little reduced and crowded anteriorly; lateral line complete at all stages.

Coloration, dull, bluish black above; duller on the sides and passing into white below; a dark lateral band from black patch on operculum to base of caudal, sometimes not well defined anteriorly; a paler narrow band above, and scattered dark scales below; lateral surface below band, and extending from base of pectoral to caudal, red in breeding males; paler or wanting in females. Dorsal and caudal fins same color as the back; pectorals and anal dusted; ventrals whitish. Length 5-6 inches.

Rubrilateralis is very close to, if not identical with, *L. carletoni* Kendall, a species reported from the state of Maine by Dr. Wm. Converse Kendall. (*U. S. F. Com.*, Vol. XXII, 1902, pp. 357-8).

CANADIAN SPHAERIIDAE.

BY THE HON. MR. JUSTICE LATCHFORD.

(*Continued from Vol. XXXIV., p. 71.*)

21. MUSCULIUM SECURIS.Prime. This species resembles *truncatum* in the abruptness of the posterior margin, but is a smaller shell. Its anterior margin is shorter and more rounded, and the lines of growth are deeper and more distinct. The valves are thicker, less glossy, and paler within and without. It occurs on a muddy bottom in St. Louis Dam, inside the viaduct, and probably outside it; and in the pond north of the electric railway station at Britannia Highlands.

22. MUSCULIUM WINKLEYI Sterki. The ponds east and west of Britannia formed by the Ottawa at high water and several of the small streams in Nepean produce this pretty little shell in considerable numbers. It was described in the *Nautilus* (XXIII, 66) from specimens found by the Rev. H. W. Winkley near his home at Danvers, Mass., and at Old Orchard, Me. From this indefatigable collector and student of the *Sphaeriidae* I received from time to time during many years delightful letters and fine sets of rare or newly described species. *Winkleyi* resembles *securis*. The first specimens from the vicinity of Ottawa sent to Dr. Sterki were thought to be a variety of that species and were marked *M. securis cardissum*. It is, however, as the description states, higher than *securis* with more rounded outlines, the hinge margin is more curled, and the difference of size and shape between the anterior and posterior parts is less marked; in *securis* the posterior part is more truncate and less obliquely so to the dorso-ventral line.

23. MUSCULIUM PARVUM Sterki. In the same number of the *Nautilus* (p. 67), Dr. Sterki distinguished and described another shell usually confused with *securis*. The types were from Ohio, but the species has a wide distribution. It is not uncommon in the Britannia ponds, but has not been found elsewhere near Ottawa. It is smaller than *securis*, the superior margin is less curved, the posterior more rounded and more oblique; the surface shining, the shell colourless, the siphons are said to be much shorter, connected, and colourless, while in *securis* they are yellow to orange, or salmon, or reddish. The Britannia shells correspond in size with the average measurements of the types: long. 4.7, alt. 4, diam. 2.8 mm.

24. MUSCULIUM PARTUMEIUM Say. In Heron's list of Ottawa Mollusca (Trans. O. F. N. C., I. 40) this shell is included with a (?). The identification was probably correct as the species is not uncommon in many small ponds south of the city, near where Heron lived. When mature it exceeds *truncatum* in size, is brighter in color, more inflated and with higher beaks. It is not as large as *jayense*, nor so pinched in before and behind the hinge. From our *rosaceum* it differs in the greater projection of the beaks, and in being more distinctly yellow in color.

This species has a very extensive range east of the Rocky Mountains, and what is now considered to be a variety of it—*M. variable* Prime—occurs as far south as Florida. In Canada the shell has been found in Manitoba and at several places in Central Ontario. I have fine specimens from Hamilton collected by Mr. A. W. Hanham, and several from Humber Bay, Toronto.

25. MUSCULIUM JAYENSE Prime. This shell, while not as large as *transversum*, is much more beautiful, and is more characteristic of the genus. It is of a brighter color, shorter, higher, more inflated and more pinched in before and behind the hinge, giving the central area of the shell, as will be noticed in the figure,

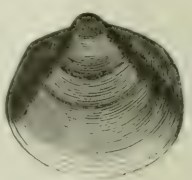


Fig. 5.—M. jayense × 1½

a boldly triangular contour. The species has a wide distribution over the middle West and extends into Michigan, but does

not, as far as I am aware, appear recorded from the State of New York.

Lake Constance is the only locality near Ottawa or in Ontario in which *jayense* has been found. It occurs sparingly in two to three feet of water on a muddy bottom at the boat landing on the Vahey farm, near Armitage station. No other *musculium* was collected in the lake, though several doubtless occur. A large rough form of *Anodonta cataracta* abounds, and a beautiful variety of *Lymnaea emarginata.*

26. MUSCULIUM ROSACEUM Prime. Shells of unusual size and beauty found many years ago in the bay at the east end of the pond below the outlet of Meach Lake were considered by Tyron to belong to this species. Unfortunately but few specimens were collected, and the best of these were distributed to correspondents. Refuse from a saw mill destroyed the locality as a habitat for delicate molluscs, and I have been unable to visit the north side of Meach Lake, where a warm muddy bay would probably furnish the shell.

In the pond on the former Cowley farm in Nepean, about two hundred yards south of the electric railway, and near the boundary of the Ottawa Land Company's property, I collected in 1913 a quantity of a large *musculium* which Dr. Sterki regards as *rosaceum.* I have visited the pond nearly every year since but have not succeeded in again finding this shell. Other species persist in surviving the total drying up of the pond in hot summers; but this seems to have become quite extinct.

None of the shells found either in the Laurentides or Nepean has a tint that would justify the specific name applied by Prime. It may be that the soft parts are sometime rosy in color as is the case frequently in *Planorbis antrorsus;* but I have not noticed that peculiarity in any shells attributed to *rosaceum.*

Dr. Sterki states that this species has been found from Maine to Virginia, and in Ohio and Illinois as well as in Ontario.

27. MUSCULIUM ROSACEUM FULIGINOSUM Sterki. A smaller and differently colored shell, but with similar outlines, occurs at the bridge on the Tavistock Road, Britannia Highlands, and a mile or so westward in Honeywell Creek, where it crosses the John Road. It is the only *musculium* I have found in either locality. While inclined to regard it as entitled to specific rank, I yield to the vastly superior experience and discrimination of Dr. Sterki, and append his description from his Preliminary Catalogue of North American Sphaeriidae (*Ann. Carng. Mus.* X, 448.)

21. *Musculium rosaceum fuliginosum.* var. nov.

Mussel small, rather short, subequipartite, moderately inflated, somewhat "pinched" along the margins; beaks nearly in the middle, narrow, somewhat prominent, calyculate; superior margin angular at the beaks, its anterior and posterior parts straight or nearly so, equally sloping; supero-anterior and posterior slopes, or truncations, well marked, nearly straight, the posterior longer and steeper nearly at right angle with the longitudinal axis, anterior and posterior ends rounded; inferior margin moderately curved; surface shining and with a silky gloss derived from very narrow, membranous, scaly projections of the periostracum on the fine concentric striae; shell very thin, glassy transparent, with a marked grayish or smoky hue.

The largest specimen measures; long. 7: alt. 6; diam. 3.8 mm.

The mussel is striking in appearance and at first sight seems to be distinct, especially since all specimens are remarkably uniform, but young and adolescent individuals reveal features of other forms of *M. rosaceum.*

Habitat. Scott Graham Creek, Carleton County, Ontario, collected by Mr. Justice Latchford, 1911 and 1913. Specimens are contained in his collection and in the Carnegie Museum, Nos. 6,945 and 7,431. Justice Latchford writes in November, 1913: "No. 2925 is quite common. I have visited the creek at all seasons and never found any larger shells than those which I send; I therefore regard them—the larger ones—as full-grown."

28. MUSCULIUM DECLIVE Sterki. In Lake Gorman and in its outlet Brennan's Creek, near Brudenell, in Renfrew, was found a pretty little *musculium* which Dr. Sterki described as new (*Nautilus,* XXV, 103). It is about the size of *securis* and of a delicate yellow colour. Although exceedingly frail, like the shell on the Breton strand so beautifully described by Tennyson, it is capable of withstanding the waves and strong currents that so

often prevail over the sandy and gravelly floors of the lake and its outlet.

Dr. Sterki's description has, I think, been republished in the *Ottawa Naturalist* and need not be repeated. The shell has also been reported from Michigan.

29. MUSCULIUM COLUMBIANUM Sterki. In a mixed lot of shells sent me by the Rev. Geo. W. Taylor marked "Quamilcham, V.I." was a *musculium* which Dr. Sterki has described as new. I append his description from the *Nautilus*, XXVI, 117.

"*M. columbianum*, n. sp.—Mussel of medium size, strongly inflated, outlines (along the valve edges) oval to elliptic without any angles, beaks somewhat behind the middle, large, prominent, rounded or slightly flattened on top, or even calyculate: surface more or less uneven from lines of growth, somewhat shining, with fine irregular striae, color light corneous to yellowish often in alternating zones, shell thin subtranslucent; hinge rather slight, cardinal teeth small, the right curved with the posterior and thicker, left anterior with apex pointed, posterior quite short; ligament and resilium rather short and slight.

Long. 4.2, alt. 3.6, diam. 3 mm. (100: 86:71).

Long. 3.3, alt. 2.6, diam. 23 mm. (100: 79: 70).

Hab. British Columbia, apparently widely distributed, and common, and rather variable with respect to size and shape (no doubt also in Washington, etc.); vicinity of Esquimalt, collected by Mr. Taylor over twenty years ago, sent by Justice F. R. Latchford, No. 6362. Cotypes with the lot in Mr. Latchford's collection. Lots simply marked "B. C.", at least some of them from that vicinity, are in various collections; Chilliwack Creek and Lake, B. C., collected by a member of the Canada Geol. Surv. Staff, sent by Mr. Whiteaves; a marsh, Duncans, B. C., received from A. W. Hanham. The first specimens were received in 1895, and the species has been regarded as distinct ever since.

30. MUSCULIUM RAYMONDI, J. G. Cooper. The late Dr. John Macoun sent me specimens of this shell from British Columbia, not stating the locality. The shell has probably a wide distribution in that province as it undoubtedly has southward in Washington, Oregon, and California. It resembles *securis* but with the posterior part of the mussel markedly higher than the anterior.

31. MUSCULIUM LENTICULA Gould. This shell is mentioned by Dr. Dall as occurring in British Columbia (Harr. Alaska Exp., XII, 140), and on his authority I give it a place in the Canadian list. The only specimens I have seen are from California.

32. MUSCULIUM LACUSTRE Muller. Dr. Sterki (*Ann. Carng. Mus.*, X, 442) gives the habitat of this species as Palearctic and Neartic Regions, Indiana, Ontario (and probably northward), California and Washington." He thinks that some of the shells considered by Dr. Dall to be *lenticula* may belong to this species.

There are several lots of *musculia* in my collection of doubtful identity. One from the small pond southwest of the intersection of the Rideau Canal and the Chaudiere branch of the Canadian Pacific Railway may be undescribed. Two others from Vancouver Island, Nos. 2364 and 2365 (b), are said by Dr. Sterki to appear not to belong to any described species.

In the continuation of this paper I shall deal briefly with the remaining genus, *Pisidium* — very largely represented in Canada in both individuals and species.

A BABY PORCUPINE.

By CHARLES MACNAMARA, ARNPRIOR, ONTARIO.

It was early in May on the shores of that expanse of the Ottawa known as Lac des Chats. The Ornithologist had disappeared into the thicket, following an unknown and elusive bird voice — goodness knows it must have been a *rara avis* when the Ornithologist did not know it — and I was left searching a pine stump for certain minute insects. After a while I began to wonder when he was coming back, for he was carrying the lunch in his rucksack, and breakfast seemed to have happened a long time ago. Suddenly he hurried around a turn in the log-road, and, a little

out of breath, he said: "I shouted for you but couldn't make you hear. I saw a fine big porcupine back there, and it climbed only about four feet up a tree. You can easily get a great photograph of it."

"Back there" proved to be a low rocky ridge thickly grown with cedars and balsams. It was only about three minutes quick walk from the pine stump, but when we arrived with the camera ready set, the big porcupine had utterly vanished, and careful searching of the surroundings yielded no result—at least in *big* porcupines. For just as we were giving up the quest, the Ornithologist caught sight of a small jet-black creature trying to hide under a cedar root. It was a baby porcupine about the size of a half grown cat. No doubt the large porcupine was his mother, but maternal instinct had failed in this case and she had deserted her offspring. The long grey-tipped hair of the adult had not grown on him yet, and he looked very black in his short under-coat. Porcupines are remarkably large when they come into the world, and although this one seemed well started in life, he was probably very young. Nevertheless he bristled his spines and slapped at us with his tail like the oldest and surliest of his race.

As a rule I am opposed to keeping wild animals in captivity, but I thought if I could feed this little fellow at home for a short time, I might learn something interesting about porcupine ways, and later I could set him free again. So while the Ornithologist hurriedly emptied our precious lunch out of the rucksack, I tried to loop my handkerchief around the porcupine so as to work him out from beneath the root, for I knew what would happen to me if I touched him with bare hands. But it could not be managed that way; there was nothing for it but bare hands after all, and they looked like well furnished pincushions by the time he was hustled into the bag. His spines were only about one quarter the length of those of the full grown animal, but they were twice as sharp. I pulled them out, one by one, with my teeth, and each of them left a drop of blood after it. Then I picked up my handkerchief and wiped my fevered brow, and a good stout spine stuck firmly in the end of my nose. I began to understand how the story started that porcupines can shoot their quills at an enemy.

Except for an occasional puppy-like whine, he lay quiet in the bag all the way home. There I fitted up a roomy box for him with a bed of fresh cedar branches, and a partition behind which, if he wished, he could retire from the garish day. And I furnished a provision of lettuce leaves, pieces of apple and a saucer of milk. But it was plain next morning that he had eaten nothing. Then when cabbage leaves and succulent willow and poplar twigs failed to attract him, I concluded that he was too young to take solid nourishment, and I tried to draw his attention to the immense advantages of milk as a food. But all my friendly advances were sullenly rejected. He put down his head and bristled his back, and looked at me with a dull but rancorous eye.

About all you can do to tame a porcupine is to speak kindly to him. You cannot try to win his confidence by scratching his head or stroking him soothingly down the back. Evidently firmer measures than well-meaning words were needed here. From former experience I knew that even large porcupines can be handled safely, if unsympathetically, with a pair of heavy leather mitts; and it was with this equipment that I made the little fellow immerse his nose in the milk, hoping that he would begin to lap it; but he wouldn't. Then I dipped my fingers in the milk and rubbed them over his lips. He registered his objection to this treatment by a squeal, but he made no attempt to bite. Porcupines never do bite in anger; their quills are their sole defence. Next I tried to feed him from a bottle, but neither the mouthpiece improvised from the rubber bulb of a pen-filler, nor what the drug clerk assured me was the best make of anti-colic feeder for human infants, met with his approval, and he whined and kicked and left dozens of quills stuck in my mitts. He had gone on a determined hunger-strike, and all my efforts ended in getting no more than a teaspoonful of milk down his throat, and that only with much trouble and disturbance. However, his fasting seemed to have done him no harm.

and between attempted feedings he climbed around his box briskly enough for a porcupine. But his occasional fits of crying were distressing.

At last on the third day of his captivity I thought of a friendly correspondent, Mr. Linwood Flint of North Waterford, Maine, who is probably more intimate with porcupines than anyone else in the world, as he rears them for sale on a "Porcupine Farm". A query addressed to him by telegram as to what to do with a baby porcupine that wouldn't eat anything brought the prompt but disappointing reply, that it was impossible to rear a young porcupine away from its mother. This dashed my hopes of porcupine study, and my only care now was to get the little creature back to his mother as soon as possible. For the last time I got my mitts full of quills while putting him into the rucksack, and just at nightfall I reached the rocky ridge where I had found him. The long walk was lightened by hearing on the way the meditative notes of the first hermit thrush of the season, and a red deer was startled from the path and leaped exquisitely over a log into the bushes. As I emptied the little creature out of the bag I had an absurd feeling of basely abandoning an infant in the wilds. But this was home to him, and as he moved off deliberately into the darkling cedars, his final leave taking was an angry flip of his spiked tail. I did not blame him; he had no reason to feel grateful to me. That night, when going to bed, as I was walking around my room in bare feet a sudden sharp pain took me in the toe. It was a last physical reminder of the little porcupine—a slender needle-sharp spine driven into my flesh.

Next day I visited again the place where I had left him, and searched thoroughly all around the spot, but discovered no trace of him. So I have no doubt that his mother, who I am sure lives somewhere in the neighboring rocks, heard his plaints in the night and came to him. And I like to think that when I was looking for him that afternoon he was safe in a nearby rock crevice, with a full stomach, fast asleep.

NOTES ON CANADIAN ENTOMOSTRACA.

By A. Brooker Klugh, M. A., Queen's University, Kingston.

The fresh-water Entomostraca have up to the present received very little attention in Canada. The only Ontario records, so far as I know, are those of Dr. G. O. Sars, who reports on 16 species, collected at Go-Home Bay, Muskoka, in 1907, by Dr. E. M. Walker, in "Contributions to Canadian Biology, 1911-14, Fasc. 2", and of Prof. Acheson, who in "*Proc. Can. Inst.*, Ser. 3, Vol. 1" lists *Daphnia Pulex?* and *Cyclops quadricornis* as occurring in Toronto tap-water. With regard to these last records, it is possible that *Daphnia pulex?* was really that species, but it is more likely to have been one of the *D. Longispina* group, which are inhabitants of open water, while *Cyclops quadricornis* is a name which was at one time used for what are now regarded as several distinct species.

These minute crustaceans are of great economic importance, because a great many of our fresh-water food and game fishes, during their young stages, feed to a very large extent on Cladocerans and Copepods, while these same Entomostraca constitute the chief food-supply of the smaller species of fresh-water fishes, which in turn are preyed upon by many of the larger fishes. The Entomostraca are thus one of the chief links in the chain of food-relations which leads from the fresh-water algae to the commercial and game fishes of our inland waters.

In regard to distribution the different species of Entomostraca differ markedly, some, as *Chydorus sphaericus*, being practically cosmopolitan, while others are apparently extremely local.

The following records, obtained in 1920, are presented as a preliminary list of Canadian Entomostraca, to which I hope to add from time to time as my investigations on this ground continue.

ORDER CLADOCERA.

Diaphanosoma leuchtenbergianum, Fischer. Frequent in plancton at 1 metre in Lake Missanag, Frontenac County, Ont., Aug. 30.

Holopedium gibberum, Zaddach. Scarce in surface plancton, Lake of Bays, Muskoka, Ont., Aug. 24.

Daphnia pulex de Geer. Well water, Guelph, Ont. Well water, Harrowsmith, Ont. Pool in woods, Aylmer, Ont.; collected by H. C. White.

Daphnia longispina hyalina, Leydig. Common in surface plancton, Lake of Bays, Muskoka, Ont., Aug. 24. Abundant in surface plancton, mouth of the Cataraqui River, Ont., Nov. 5.

Daphnia longispina hyalina mendotae, Birge. Common in surface plancton, mouth of the Cataraqui River, Ont. Nov. 5.

Simocephalus vetulus, O. F. Miller, Common among decaying vegetation at the bottom of a shallow channel in a marsh on the Cataraqui River, Ont.

Ceriodaphnia megalops, Sars. Scarce in the same habitat as the preceding.

Bosmina longirostris, O. F. Müller. Common in surface plancton, Lake of Bays, Aug. 24. Common in surface plancton, mouth of the Cataraqui River, Ont.

Bosmina longispina, Leydig. Common in plancton at 1 metre, Lake Missanag, Ont., Aug. 30.

Alona guttata, Sars. Scarce in surface plancton in shallow channel in a marsh on the Cataraqui River, Ont., Nov. 5.

Chydorus sphaericus, O. F. Muller, Common in surface plancton, mouth of the Cataraqui River, Ont., Nov. 5.

Polyphemus pediculus, Linn. Frequent in plancton at 1 metre, Lake Missanag, Ont.

ORDER OSTRACODA.

Cypridopsis vidua, O. F. Müller. Common among aquatic vegetation at mouth of the Cataraqui River, Ont. Common in a marshy pond near Kingston, Ont.

Cyclocypris laevis, O. F. Müller. Common among filamentous algae at the mouth of the Cataraqui River, Ont.

Cypris dentata, Sharpe. Abundant in a pool near Kingston, Ont.; collected by H. C. White.

Cypris testudinaria, Sharpe. Common in a pool in the woods, Aylmer, Ont., May; collected by H. C. White.

ORDER COPEPODA.

Diaptomus oregonensis, Lilljeborg. Abundant in plancton at 1 metre, Lake Missanag, Ont. Common in surface plancton, mouth of the Cataraqui River, Ont.

Cyclops biscupidatus, Claus. Common in surface plancton, Lake of Bays, Ont., Aug. 24. Common in surface plancton, mouth of the Cataraqui River, Ont., Nov. 5. Common in surface plancton, Lake Ontario, Dec. 15.

Cyclops viridis brevispinosus, Herrick. Common in plancton at 1 metre. Lake Missanag. Aug. 30.

Cyclops fimbriatus, Fischer. Scarce in channel in marsh at mouth of Cataraqui River, Ont.

Canthocamptus minutus, Claus. Scarce in surface plancton, Lake Ontario at Kingston, Dec. 15.

N. B. — Since the above was written, copies of Parts H and J of Vol. 7 Report of the Canadian Arctic Expedition containing records of Arctic Cladocera by Dr. Juday and Copepoda by Dr. Marsh have come to hand.[1]

[1] Dr. Robert Chambers in Biological Bulletin, Vol. 22, p. 293, mentions the occurrence of **Cyclops parens** and **C. Americanus** at Toronto. The Euphyllopoda and parasitic Copepoda have not been considered. — **Ed.**

A BOTANICAL TRIP THROUGH GERMAN SOUTH-WEST AFRICA.

By W. P. THOMPSON.

In 1912 the writer visited the former German colony in south-west Africa chiefly in order to secure material of *Tumboa* (*Welwitschia*) *mirabilis*, mirabilis both from the morphological and physiological standpoints. It was necessary to make a trip across a very extreme desert whose scanty flora exhibits remarkable xerophytic adaptations. The conquering of this colony by the late General Botha and General Smuts and the future probable relationship of the territory to the British Empire under a mandatory held by the Union of South Africa may lend a special interest to the following notes on that trip.

Landing at Swakopmund on the west coast, one is in a region in which, according to the official German records, the rainfall averages about one inch a year, though many years may pass with no precipitation. At the time of my visit the natives could not remember when the last rain had fallen but were sure that whenever it was it had been only a sprinkle. As one proceeds eastward the rainfall increases slightly but at no place amounts to more than ten inches annually. Apparently in all this portion of the continent the rainbearing winds cross Africa from the Indian Ocean losing their moisture on the way. The natives stated that the sprinkles always came from the east. In the British territories across to the east coast the rainfall is much heavier.

This distribution of moisture available for the vegetation is modified in a remarkable way by the fact that several old dry river beds cross the colony from east to west. Apparently the climate was formerly much moister than at present. Occasionally heavy rains in the British territories to the east cause the water to flow down these old river beds. Sometimes the flood nearly reaches the sea before being absorbed. For long afterwards these valleys support a vegetation different from that of the surrounding desert. They are then long band-like oases.

For many miles from Swakopmund, outside the dry bed of the Swakop, one can find only three species of plants and very few specimens of them (a *Zigophyllum*, a *Mesembryanthemum* and an *Arthaerua*). They look like haycocks on an immense field of sand. In addition to the lack of moisture these plants have to contend with the continually wind-driven sand. All day long the presence of the fine particles of sand in the air makes the horizon as highly colored as one of our sunsets. The sand lodges against the plants and tends to submerge them while the plants strive to surmount the rising sand. In this way high dunes are built up round a single plant. Usually the plant is beaten in the struggle with the sand which later blows away and leaves the dead plant exposed. The only other vegetation of this strip near the sea consists of numerous orange-colored lichens on the desert rocks. These appear to derive their moisture from the heavy dews, so heavy that on many mornings they drip off the roofs of the houses in Swakopmund. In fact it is difficult to see how even the flowering plants can survive unless they utilize these dews.

As we went inland by broad-wheeled carts following the route from Swakopmund to Windhuk (the capital) later followed by General Botha, we found new plants making their appearance as increasing moisture enabled them to survive. After a time we met outlying specimens of the famous "good Karoo bush" (*Augea*) on which the still more famous sheep of the South African farmer largely subsist. At fifty miles from the coast we found *Tumboa*, the chief object of the trip.

This remarkable plant is like a huge turnip bearing throughout its life only two leaves which soon become torn to narrow shreds by the wind. In adult specimens the body is five or six feet in diameter and the leaves stretch for twenty feet across the desert sand. As the plants may be more than one hundred years old the length of life of its two leaves far exceeds that of any other known leaves. The centre of the turnip rots away leaving a narrow atoll-like rim of stem above the sand. *Tumboa* is a member of the order Gnetales, the highest of the Gymnosperms which show in nearly every structure ap-

parent transitions to Angiosperms. It bears cones like gymnosperms but in the axil of each scale is a flower of Angiospermic structure. Its distribution is no less remarkable than its morphology. In this locality it is found in an area of only a few square miles. This and another similar locality further north are the only places in the world where it is found.

Tumboa's neighbors have adopted varied methods of contending with the drought. The Naras, *Acanthosicyos horrida* (Cucurbitaceae), has completely discarded its leaves and consists simply of a mass of green, hard, extremely sharp pointed thorns sprawling over the sand. Its roots go down to subterranean water and may be fifteen meters long. The Geraniaceous *Sarcocaulon* has completely waterproofed itself in a coat of hard wax which may be ten millimeters thick. The coat remains as a hollow shell long after the plant has died and rotted away. The wax burns readily and the plant is therefore called Hottentot candle. Several species have imitated the succulent cactus though belonging to very different families. Several members of the milkweed family have become switch plants. Strangest of all perhaps in this climate is the ice-plant (Mesembryanthemum) with its large soft leaves completely covered by droplets of cool liquid. To expose its water in this way when the supply is so extremely scanty seems to be about the worst thing the plant could do.

A fact which soon strikes the botanist is that in spite of strong resemblances in external features to the plants of American deserts these belong to very different families. For example, one sees many cactus-like plants but no cacti. A large proportion of the flora consists of members of the milkweed family which are there switch-plants. Families which the North American botanist has never seen there simulate our own xerophytes to a remarkable degree. So strong is the resemblance in many cases that one can scarcely believe that the flowers, showing the true botanical relationship, really belong to the plants on which they are found. We have here a good illustration of entirely unrelated plants acquiring the same characteristics under similar conditions.

During the whole trip only one species of our great rose family was seen, only three crucifers and only three members of the buttercup family (all *Clematis*). On the other hand, families poorly represented here but relatively abundant there are the Asclepiadaceae, Tiliaceae (chiefly shrubby *Grewias*), Geraniaceae, Aizoaceae, Zygophyllaceae and Anacardiaceae. Families with many representatives in both places are Liliaceae, Leguminosae and Compositae.

The old river beds constitute an interesting variation from the desert waste. Their periodic flooding from the interior enables a richer though still sparse vegetation to survive. An occasional gardener takes advantage of this moisture to raise a few vegetables which are sold at fabulous prices to the town dwellers. A number of large wells as big as a house are dug in the dry river bottom. Into these a little water soaks during the night and is pumped out next day on to the small garden. After a time the wells go completely dry and the gardener moves a half-mile along the river and digs a new set. Sometimes several moves are made between floodings.

In these river bottoms the vegetation consists chiefly of scattered shrubs and trees. There are the date palm, a fig, several thorny acacias, the tamarisk and an ebony. One of the most successful plants in this habitat is a tobacco (*Nicotiana glauca*) which reaches the size of a small tree. It was introduced by the early missionaries.

Farther inland the increased moisture supports a somewhat richer vegetation. In places the vegetation is of a type which rapidly bursts into flower after a rain and then dries up until the next rain. In few places is the ground completely covered, the plants being in scattered clumps and consisting chiefly of grasses. The German Government had encouraged in every possible way the agricultural development of the colony, but even the best parts of the country are unsuited to anything but ranching. The few ranchers who had been induced to settle in the eastern portion were making a precarious livelihood at the beginning of the war. A few municipalities in Canada are worth more agriculturally than the whole territory.

SWARTH ON THE FOX SPARROW.

BY P. A. TAVERNER.

This monograph on the Fox Sparrows is an excellent example of the species-splitter at his best, and worst. That sixteen subspecies are recognized is testimony to the fineness of the splitting, but the use made of these fragments goes a long way to justify the process. Too often systematists have assumed, when they have divided their species into as many fractional parts as possible, that their responsibility was ended, whereas they have only just laid out their tools for serious scientific effort. Mr. Swarth realizes that splitting is a means to an end and not an end in itself, and has developed his subject with a grasp and appreciation of the problems involved that is all too rare in revisions of this kind.

The first 29 pages are taken up by an introduction and chapters on Materials and Methods of Treatment, History, Variation in *Passerella iliaca* and Distribution and Migration that are models of their kinds. The remainder is composed of systematic treatment, description and discussion of the races considered, a list of all the material examined and a beautifully drawn and colored plate from the brush of our countryman Major Allan Brooks illustrating the extremes of two subspecific groups.

The species is remarkably homogeneous over most of the continent but breaks up into many races within and west of the Rocky Mountains. These races are discussed, their relationships pointed out, they are traced from their summer to their winter habitat, and many interesting problems regarding them are suggested.

An interesting conclusion is derived from the movements and distribution of the British Columbia and Alaska coastal forms. Those that summer farthest north winter the farthest south. The more southern breeders winter more northerly, and so on progressively to the Vancouver Island vicinity birds which are practically stationary throughout the year.

Another important point brought out is that the birds breeding in the most humid climates are not the darkest or the largest of the species. *Unalaschensis*, summering in the extremely moist Alaskan Peninsula, does not reach the extreme development of size or depth of color that is attained by *fuliginosa*, resident on the comparatively dry Vancouver Island region. This perplexing fact that would otherwise seriously shake one of our most cherished ecological principles is explained by the fact that the northern race spends its winter in arid southern California, and probably experiences a much lower annual average moisture than does the darker and larger race. It is thus brought forcibly to our notice that, in studying the relationship between the bird and its environment, winter ranges and probably migrational routes should also be taken into consideration.

Some distributional anomalies are pointed out. Some forms range widely over varied and more or less discontinuous conditions unmodified, whilst very slight barriers have induced specialization in others. Kadiak Island, but slightly isolated from adjoining territory, has its definable subspecies, *insularis*, yet the Queen Charlottes, situated far out to sea and noted for their peculiar forms, have developed no specialization in this species.

Mr. Swarth divides the Fox Sparrow, *Passerella iliaca*, into sixteen subspecies falling into three groups which for convenience he calls after their most characteristic component members. Thus he gives us:—

I.—The Iliaca group.

1. *P. i. iliaca*
2. *P. i. altavagans*

II.—The Unalaschensis group.

1. *P. i. unalaschensis*
2. *P. i. insularis*
3. *P. i. sinuosa*
4. *P. i. annectens*
5. *P. i. townsendi*
6. *P. i. fuliginosa*

III.—The Schistacea group.

1. *P. i. schistacea*
2. *P. i. fulva*
3. *P. i. megarhynchus*
3. *P. i. brevicauda*
5. *P. i. canascens*
6. *P. i. monolensis*
7. *P. i. mariposae*
8. *P. i. stephensi*

Of these we have nine in Canada either as breeders or migrants, including all the first two groups and the first of the third.

Iliaca, characterized by foxy color, ranges all over eastern Canada to the Rocky Mountains and Central Alaska. In the mountains, through *altavagans* it approaches *schistacea,* which is characterized by the reduction of red and a great increase of slaty color. *Altavagans* and *schistacea* occupy most of the interior of British Columbia. The *unalaschensis* group are large maroon-brown birds occupying the coast, from *fuliginosa,* resident in the Vancouver Island vicinity, through *townsendi, annectens, sinuosa* and *insularis,* to *unalaschensis* of the Alaska Peninsula.

In the systematic body of the paper, dealing with the description, salient characters and ranges of the forms dealt with, are many illustrative drawings, maps, etc. The whole is admirable in plan and construction and clearly presented. It is not until we come to study carefully the drawings of some of these distinctions that any doubt is awakened as to the expediency of perpetuating all these many names. Distinctions that seem clear and satisfactory in print in some cases become very faint in illustration. Whilst we can be assured that they are the best possible presentation of the case many of them can be felt rather than seen. A small amount of individual variation would swamp some and even the inescapable personality of the draughtsman may be a determining factor. In the excellent colored plate by Allan Brooks *brevicauda* and *unalaschensis* are seen to be so much alike in color that the otherwise excellent three-color process plates have absolutely failed to differentiate them. When it is realized that average characters are regarded as sufficient basis for subspecies making and that the author calls special attention to the number of intermediates in his material one can be pardoned for harboring some mental reservations.

In this connection the reviewer is fortunate in having access to some of the material upon which the work is based and that bears the author's determinations. A careful examination of it in comparison with the text does not allay all doubt. Specimens of *altavagans,* referred by the author to the *Iliaca* group seem more closely related to *schistacea,* in plumage barely separable from it. The *Unalaschensis* group, represented in the material by all but *insularis,* shows a gradual gradation from the comparatively small and lighter colored northern *unalaschensis* to the big, dark *fuliginosa* of southern British Columbia. These gradations are postulated by the writer to occur in marked steps with alternate distributional areas of constancy and variability. It is neither safe nor just to pass final judgment on the suddenness of these variations without having seen all the material upon which the conclusions are based, but the slightness of the characters and the limitations of collecting on a long line of uninhabited coast naturally make one wonder whether the gradation is not a little more gradual than is assumed, and but indicates extended intergradation in which perhaps all characters do not change at an equal rate, and where there are possibly occasional disturbing factors.

Whilst we do not seriously doubt that most if not all of these differences exist, or that Mr. Swarth can see and differentiate them, we admit our inability to do so in some cases and doubt whether any one else without his natural aptitude, amount of material and the obvious concentration he has put upon it can be trusted to identify many of these laboratory varieties. Identification of Fox Sparrows to the Swarth standard thus becomes a one man's work and is practically impossible of verification or intelligent correction by others. However, fitted in this case that one man may be in keenness of perception, honesty of purpose and balance of judgment we tremble at the results that may arise from the use of these minute subdivisions in the hands of the less experienced or responsible. This is certainly no work for the dilettante, and we question the expediency of presenting undemonstrable races for the use of the general public.

It is notable that when Mr. Swarth came to make a serious study of this species he was not content to accept the determinations of *anyone* else, but very properly went to the original material and carefully worked it all out again to his own satisfaction. And thus it must ever be when serious use is made of subspecific variation in constructive science. Of what use have been the numerous trinominals applied to Fox Sparrows in the many local

and other published lists? As far as Mr. Swarth was concerned they were no more than specific binomials. In this connection it is interesting to note that the author consistently applies the binomial *Passerella iliaca,* the Fox Sparrow, to all the subspecies collectively, and differentiates the type form as the Eastern Fox Sparrow *Passerella iliaca iliaca,* definitely naming it as a subspecies on a par with the others. All this is in perfect harmony with the views for which the present reviewer has lately been severely criticised. There seems much in this paper to justify his stand.

It is also to be noted, as showing a natural trend of the present subspecies maker, that the author has found it expedient to use group names for associations of his subspecies; so we have arrived at the stage of the super-subspecies in spirit if not in fact. With an extension of this principle and more thoroughly developed perceptions we are faced with the possibility of super-subspecies and sub-subspecies until we may be forced to adopt algebraic formulae or chemical symbols for the representation of the more involved relationships, an eventuality not without some promise.

These groups as defined by Mr. Swarth are plainly recognizable entities and as such must be taken into consideration as well to systematize a complicated idea as to properly reflect zoological facts. The component parts of these groups are, as said before, less obvious and it is debatable whether or no it is not sufficient for the general worker to lump them under their group associations, leaving the finer determinations to the specializing expert. In this particular case, one solution naturally suggests itself.

It does not appear that Mr. Swarth with all his material has demonstrated actual intergradation between these three groups. In fact he remarks that they approach but remain distinct. Might it not be well then to acknowledge the apparent logic of the evidence and raise them to the specific status to which they seem entitled? The evidence is as strong in this case as for the Oregon Junco, the Northwest Crow and others that may be mentioned, and is strengthened by the fact that the Eastern Fox Sparrow is a particularly constant form, while the western races are highly variable, suggesting a fundamental distinction between them at last.

In spite of all the above criticism, either stated or implied, Mr. Swarth is to be congratulated on the presentation he has made of his thesis. The faults, so judged by the reviewer, are those of prevailing practice, the virtues are all his own. The necessity of studying even the finest variations is not questioned, the necessity of dignifying all of them with formal names and thus exalting their importance to a par with those of demonstrable status is doubted. The question is one of expediency rather than of fact. However this may be, the thoroughness which is evidenced throughout, the care that has been taken to provide the widest basis of material, the keenness with which the author has analyzed his phenomena and the clarity with which he has stated them and his conclusions makes this one of the noteworthy specific revisions.

NOTES AND OBSERVATIONS.

BIRD BANDING.

The work of bird banding, from which so much may be learned concerning the life history of birds, has been taken over from the Societies which were carrying on this work by the U. S. Biological Survey. All success is wished the Survey in this line of endeavour.

The following article is printed at the request of the Biological Survey, to acquaint the public of Canada wth this work.

CHECKING UP THE MIGRATION OF BIRDS.

"The desire to learn what became of birds that flew South with the approach of cold weather led Audubon — the great American naturalist — to place silver threads about the legs of a brood of phoebes. The following spring he was rewarded by having two of the birds re-

turn to nest near the haunts where they learned to fly.

"This occurred early in the nineteenth century, and was the first known case in America of bird banding. Since that time this means of securing information on the movements and life history of migratory birds has been used by many societies, and every fall thousands of birds fly south bearing a narrow ring, stamped with a number, about one of its legs.

"So valuable is this work, especially with game and insectivorous species of birds, that in 1920 the United States Department of Agriculture took over the experiments being conducted by the American Bird Banding Association, the society's work having outgrown its available resources. Since it is the returns from bird banding that furnish the data desired in this branch of research, it is of prime importance that the methods employed be improved and that the percentage of birds under observation be increased. To assist co-operators in this work, the department has published Department Circular 170, Instructions for Bird Banding, which is just available for distribution.

"It is the plan of the Biological Survey of the department, which is supervising the bird-banding work, to advance this method of research along two principal lines: first, the banding of fledglings as formerly practiced; and second, the systematic trapping and banding of adult birds. As the banding of fledglings has the advantage of affording valuable information on the ages of birds, the survey wishes to encourage these activities, but it desires to lay special emphasis on the added value of the systematic trapping of adults.

"With the establishment of a well-connected chain of trapping stations throughout the United States and Canada, regular 'returns' are confidently expected by department specialists with reports of retrapping birds that had been banded at the original and other stations. Data thus afforded are already indicating the exact lines of migration of individual birds, the speed of travel, and innumerable items of interest, many of which have a direct bearing upon the study of life histories and the administration of the Migratory Bird Treaty Act with which the Department is charged.

"The department issues bands of two types to co-operators in the work. One type is the split ring band for all small birds, and the other is the flat strip band that is adjustable for all large birds. For general land-bird trapping the so-called Government 'sparrow trap' has been found the most satisfactory. The bulletin contains details of construction of this trap. It also discusses other methods of trapping, the operation of traps, handling and releasing birds, and filling out reports. Federal trapping permits for this work are required under the Migratory Bird Treaty Act. Applications for permits and requests for the bulletin should be addressed to the Bureau of Biological Survey, Department of Agriculture, Washington, D.C."

In Canada, applications for permits to carry on this work should be made to the Commissioner, Canadian National Parks, Department of the Interior, Ottawa. Persons holding federal permits to take birds for scientific purposes require no other permit. It would be needless duplication for records of banding to be kept in the U. S. and Canada, as the birds do not respect our boundary in their migration; consequently the records for the continent are being kept at Washington.

PROBLEMS THAT CAN BE SOLVED BY BIRD BANDING.

1. How fast do the individuals of any species travel on their periodic migrations; that is, how many miles per day will any one bird average during these journeys and what is the total time consumed in a trip?

2. Does any one flock continue in the van or is the advance made by successive flocks passing one over the other in alternate periods of rest and flight?

3. Do individuals of any species always follow the same route, and is it identical for both spring and fall flights?

4. Do migrating birds make the same stop-overs every year to feed?

5. How long do birds remain in one

locality during the migration, the breeding, or the winter seasons?

6. What is the relation between the breeding and the wintering grounds of individuals; that is, do those birds that breed farthest north, winter farthest south, thus jumping over those that occupy the intermediate zone, or do they merely replace the latter individuals as winter residents?

7. Do birds adopt the same nesting area, nest site, and winter quarters during successive seasons?

8. For how many broods will one pair remain mated, and which bird, if not both, is attracted next year to the old nesting site?

9. To what extent do males of a species assist in incubating and brooding?

10. How far from their nests do birds forage for food, and after the young have left the nest, will the parent birds bring them to the feeding and trapping station?

11. To what regions do the birds go, particularly the young, that do not return to the vicinity of their original nests?

12. How long do birds live?

For the solution of these and related problems, it is important that the traps always be set on the original site, for birds already have returned to the same traps through four or five consecutive seasons. Many "returns" will, in the course of time, afford answers to the important problems here presented.

NIGHTHAWK NESTING IN A PEAT BOG. — On June 4th, 1921, we were in pursuit of Lincolns Sparrows, Yellow Palm and Myrtle Warblers in a large open peat bog located on the south shore of the Gulf of St. Lawrence. The vegetation was mostly Labrador tea and rich green mosses fully a foot in depth, with spruces moderately spread out all over the territory. This is a wonderful country for bog-loving species, — Lincolns and Swamp Sparrows, Wilsons and Yellow Palm Warblers being actively occupied in domestic duties. The Whitethroat's whistle, always welcome, could also be heard from all sections of this beautiful bogland.

As is sometimes the case the unexpected happens and one receives a pleasant surprise. Here and there were scattered patches of sun-baked peat and from one of these a Nighthawk departed rather reluctantly, disclosing a single egg. The nesting site chosen was slightly off elevated ground and was sheltered from any high winds that might occur. There was no attempt at nest building, merely a feather of the female lying alongside the egg. Two days later we found that the Nighthawk had taken exception to a handkerchief tied to the branches of a spruce as a landmark, or perhaps she detected, in this sign of the human, evidence of further intrusion. In any event the egg had disappeared and the bird, no doubt, exercised her privilege of retiring to another secluded spot some distance away, as further efforts on our part failed to locate her.

W. V. BROWN, Westmount, Que.

THE CANADIAN FIELD-NATURALIST

VOL. XXXV. GARDENVALE, QUE., MAY, 1921 No. 5

OVERGROWTH OF STUMPS OF CONIFERS.

By C. C. Pemberton.

Perhaps the most remarkable feature in connection with the subject of the overgrowth of stumps of certain conifers is the fact that many botanists have never heard of the existence of this phenomenon. This is all the more remarkable as it is a phase of vegetable life which has been observed in different parts of the world for a long time and various authorities have, from time to time, published references to it.

The findings of those who have investigated this subject in one country often do not seem to have been known to those in another, later writers being apparently unaware of previous investigations. Evidently the references published in the past have attracted little attention and the subject has been speedily forgotten.

I have found that many plant physiologists, on learning of the phenomenon, incline to the idea that the overgrowth is the result of a mysterious power in the reserve material of the stump which enables it to continue indefinitely to form woody matter without aid of foliage or organs of assimilation of any kind. They comment on the fact that broadleaf trees, and even larch, can have their felled stems make a limited amount of callous growth in the spring following the felling. Other physiologists from the first have deemed the reserve material explanation utterly inadequate and have considered the continuity of vitality, healings and bulky formations of cappings of new wood to be possible only by parasitism— of some sort — with a chlorophyll-possessing host plant.

Some years ago, when I took up the study and investigation of the characteristics of the native trees in the environment of Victoria, I found it impossible to discover any authoritative writings on the subject of these stumps, but by degrees I learned that the matter had received attention from several writers. Unfortunately the full texts of these publications have never been obtainable here, and I have, therefore, been unable to ascertain to what extent investigations have been carried.

From Mr. A. D. Webster, whom I first met when he was Superintendent of Regent's Park, England, I have learned that the English forester, Grigor, (who died in 1848) had, in his book *Arboriculture*, referred to the power of coniferous trees to continue the formation of healings and new wood after the loss of their stems and foliage; that while this statement had been scoffed at by subsequent French reviewers of the book, Mr. Webster's father, Mr. John Webster, who had noted the characteristic in Larch, Silver Fir, Scotch Fir and Spruce, had by production of actual specimens been able to prove that Grigor was correct in his assertions; and that the findings of Mr. John Webster had then been published in an essay "On the Growth of Roots of Coniferous Trees After being Felled," which appeared in the *Transactions of the Highland Agricultural Society"*, No. III, Fourth Series, 1870-1871.

In Elwes and Henry, *Trees of Great Britain and Ireland* (privately printed, MCMIX) vol. IV, p. 726, I find that mention is made of these overgrowths as being the result of root graft, and in a foot-note (No. 3) reference is given to Mathieu, *Flore Forestière*, 529 (1897).

W. Dallimore, in his article "Natural Grafting of Branches and Roots", in *Kew Bulletin*, Nos. 9 and 10 (1917), p. 305, quotes the German authority, Sorauer, (*Handbuch der Pflanzenkrankheiten*, Berlin, 3rd Ed. 1909, Vol. 1, p. 774). From perusal of a translation of a transcript from Sorauer (kindly obtained for me by Mr. G. B. Sudworth, dendrologist, U. S.

A.), it appears that the German authority refers to a general opinion that the material contained in the stump prior to felling might be the only source of the new formations, and that they might also be due to root-graft between the stump and a tree possessing its crown; but he instances absolutely isolated stumps in which he avers the reserve material would not be sufficient explanation of the bulky formations which take place. He refers, in this connection, to the chlorophyll to be found in the rims of the overgrowth and says there is no reason why this chlorophyll apparatus should not assimilate as well as the green bark of the trunk.

It appears then that European views of the cause of the overgrowth have differed. While the overgrowth is conceded on one hand to be a consequence of root-graft there are authorities who think it might be initiated by reserve material, and in the case of isolated stumps that the chlorophyll in the rims of the overgrowth might fulfil the functions of foliage. No particulars are given, so far as I can learn, of the steps which were taken to establish that the remote stumps were absolutely isolated.

On this continent Prof. Willis Linn Jepson appears to be the first to publish any



Fig. 1: Douglas fir, **Pseudotsuga taxifolia** (Poir.) Britt. Completely capped-over Douglas fir stumps — living posts — the vitality and capping-over being due to root union with foster-tree to the right. Locality, Admiral's Road, Esquimalt district, Vancouver Island.

reference to the characteristic of the healing and overgrowth of stumps. In *The Trees of California* (Cunningham, Curtis and Welch, San Francisco, 1909) p. 33, speaking of the second-growth circles of the Redwood, Prof. Jepson refers to the overgrowth of Douglas Fir stumps and says "the cause of this phenomenon is due, undoubtedly, to natural rootgrafting."

In the *Scientific American*, Vol. CVIII, No. 5, p. 112 (1913), continuity in vitality and healings and overgrowth of stumps of Cuban Pine (*Pinus heterophylla*), Long Leaf Pine (*Pinus palustris*), and of stumps of Douglas Fir, (*Pseudotsuga taxifolia*) and Redwood (*Sequoia gigantea*) are spoken of as being a puzzle to the forester, and the statement is made that it would seem reasonable to conclude that these stumps are parasitic and that their roots are grafted to those of neighbouring trees.

In the article "Natural Grafting of Con-



Fig. 2: Bigtree, **Sequoia washingtoniana** (Winsl.) Sudworth. Completely capped-over stump of a California Bigtree, from the collection of the U. S. Forestry, Washington, D. C. Published by the courtesy of Mr. G. B. Sudworth, Dendrologist, U. S. Forestry, Washington, D. C.

ifers", *Proceedings of the Society of American Foresters,* Vol. XI, No. 4, (October 1916) p. 394, Prof. Harold S. Newins, Associate Professor of Forestry, Oregon Agricultural College, calls these stumps "Growing Stumps", and refers to the fact that they may be found growing vigorously and yet isolated as far as 20 feet from any growing tree (I have found them 50 feet). He says: "When found so isolated, the common belief has been that they subsist by drawing on a reserve supply of food materials which have been stored within their bodies and roots." He finally says that such "Growing Stumps" are the result of conjunctive symbiosis, which is made possible by their root-graft with a living tree. The two investigators on the Pacific Coast have therefore no hesitation in ascribing the cause of the overgrowth to natural graftage of roots with growing trees of the same species.

When, some years ago, I learned that the root-graft theory of the cause of the vitality and overgrowth of the stumps was doubted, I went to considerable expense in having doubtful-looking cases tested by excavation of the roots and in every instance the root-graft was established. It seemed that a very slight graft was sufficient, and that the host tree need not be very large to accomplish the overgrowth of a stump of a tree of greater size. I found it difficult to discover a stump very remote from other trees. The scattered large Douglas Fir of the original parklands of the vicinity were mostly still standing and the young growth was generally in dense formation. There was one instance in which a group of nine capped-over Douglas Fir stumps were distant over fifty feet from a large tree and there was absolutely no indication of roots of the stumps and tree being anywhere near each other; nevertheless, excavation proved that actual root-graft existed. The roots of the big tree stretched at a depth of two feet below the surface past the group of smaller trees, the tap roots of some of which had become grafted to the underlying roots of the big tree. These stumps, so grafted, were in turn root-grafted to others more remote and all were overgrown alike. This, I think, shows that apparently remote stumps may really be root-grafted to growing trees by a series of concealed, unsuspected root-grafts. The more especially may this be so as frequently the major parts of the stumps are decayed and portions of roots only remain vital. This phase of the question, in my opinion, explains how remote and apparently isolated stumps can show bulky overgrowth. There is probably a chain of root-grafts connecting the stump with living trees. I have never been able to learn of an overgrown stump proved, by actual and complete excavation of all its roots and rootlets, to have no direct or indirect root-graft with foliage-possessing trees. The great spread of the lateral roots of conifers may not always be realized, and this, combined with indirect root-grafts, may enable overgrown stumps to have a source of elaborated food in a distant forest. In fact, it is hard to say whether the translocation of elaborated sap would ever stop as long as there were living stumps and direct and indirect root-graft with sufficient canopy of foliage. The question could be easily settled experimentally, as well as the point whether one species is more potent in this respect than another. The grafting together of the roots of separate trees should be of easy accomplishment artificially in a single season, and then, if the stems of those trees intended to be used for tests were cut the following year, an immediate overgrowth should commence in species prone to show the characteristic. The stumps in some species of conifers are said to respond more quickly than others. I have observed the phenomenon in Douglas Fir (*Pseudotsuga taxifolia,* (Poir.) Britt.) and in Grand Fir (*Abies grandis,* Lindley) only, the Douglas Fir being far more potent in overgrowth than the Grand Fir. In both species, when the overgrowth is cut off, a renewed healing takes place. I have never, however, seen a healing and overgrowth by means of secondary or indirect root-graft in the Grand Fir. Stumps showing healing and overgrowth abound in all districts in the vicinity of Victoria. In the Douglas Fir the heartwood of the stump is usually charged with resin and a complete capping takes place. In the Grand Fir the heartwood nearly always decays and a rim only of live wood ensues. The

Douglas and Grand Firs are the only two trees which I have had the opportunity of studying. The characteristic seems to obtain in all conifers where root union has taken place. Doubtless it would not occur in conifers which possess the power of stump sprouting, such as the California Redwood (*Sequoia sempervirens,* (Lamb) Endlicher). The Bigtree (*Sequoia washingtoniana* (Winsl.) Sudworth), on the other hand, cannot sprout but shows the overgrowth characteristic in a very marked degree.

The question of the frequency of natural graftage as well as the extent to which it takes place among the trees in a forest is necessarily pertinent to the consideration of the question of overgrowth. Inarching of roots of a single tree is a well-known phenomenon. Whether wholesale inter-



Fig. 3: Douglas Fir. Partial overgrowth of stump (to the right) due to natural graft of its roots with those of a foster Douglas fir (to the left) The graft has developed into a bar of wood connecting the tree and stump. The ring of annual increment of the living tree on the left is seen to be enveloping the stump on the right. The centre of the stump, not being preserved by resin, is decaying and would have become one of the hollow stump types in which there is a rim of live wood only. Locality, Sylvan Lane, Gonzales Hill, Victoria, B. C.

grafting among the roots of similar species in the forests takes place always or does not do so, seems to be unknown. As destruction of primaeval forests has, in land clearing operations, been taking place all over the country for a great length of time, one might expect that agricultural and forestry works would cover this point. Such, so far as I can learn, is not the case. The extensive root grafting of some conifers on the Pacific Coast has, however, forced itself on the attention of foresters and others. It has been noted in Douglas Fir and in Western Hemlock (*Tsuga heterophylla* (Raf.) Sargent). Mr. W. R. Carter, Assistant Biologist, British Columbia Provincal Museum, Victoria, B. C., has informed me that on some of the coastal areas of the West Coast of Vancouver Island, wind, or other erosion, has disclosed continuity in root systems of Western Hemlock and other coniferous trees. This continuity of roots is often exposed to view for three or four hundred yards at a time. Others have spoken of the root-graftage of the hemlock impeding land-clearing operations. There does not appear to be any record whether the Hemlock root or stump



Fig. 1: Douglas fir stumps completely capped over by root-union with a foster tree. The roots from the foster tree are seen stretching through the centre of the group of stumps, some of which were united by graftage of their tap roots with the underlying roots from the big tree. The stumps on the outside of the group had no direct root graft with the foliage-possessing tree, but only indirect graft with those which had. Locality, Goldstream Road, Colwood, Esquimalt district, Vancouver Island, B. C.

sprouts or whether it has the overgrowth tendency. (It would be interesting to learn what the effect of this extensive continuity of root systems had on the stabilizing of the trees in the gale of last winter (Jan. 1921) which did such extensive damage uprooting valuable coniferous timber on the coasts of British Columbia, Washington and Oregon). At Rouvray, in France, while with the Canadian Forestry Corps, I particularly noted that the graftage of the roots of the Pines (Sylvestris, I think), was very noticeable. (Strangely enough, in one case where the bases of the stems of three pines were united and one tree had been felled some time previously, the stump showed no signs of vitality or overgrowth.) On the other hand I have seen the roots of coniferous trees intermingle without apparent graftage ensuing, and one often finds the stump of one Douglas Fir tightly pressed against the stem of a growing tree but no sign of vitality or overgrowth in the stump. From this I judge that contact and pressure will not always be followed by graftage. The cause of natural graftage of roots was considered by Mr. Dallimore to be mainly pressure, and Prof. Newins assigns the cause to pressure and affinity of species combined with other physical factors. In Elwes and Henry the fact that the bark remains alive to an advanced age is said to account for the vitality and consequent overgrowth of stumps of Silver Fir.

The feasibility of utilization of the wondrous creative biological power shown in the continuity of vitality and healing-over of these stumps of coniferous trees does not seem to have ever been contemplated in horticulture or silviculture.

Living fence posts can be grown, for they do naturally grow, and it should be easy to ensure the graftage of roots artificially. Metal or concrete caps fashioned for ornament or use could be placed on the stumps when cut and these would readily become enveloped by the overgrowth. These posts would last forever. Prof. Newins mentions an instance of an overgrowth having 200 rings, and at Stanley Park, Vancouver City, — close to the "Seven Sisters' — there is a capped-over Douglas Fir stump which must be nine or ten feet high. The foster-tree could be renewed from time to time if it became too bulky.

It is certain that trees retaining foliage canopy can, by direct root-graft and also apparently by indirect root-graft, transmit elaborated sap to remote stumps. The converse might be equally true, and the roots of stumps in moist rich soil might, by root graft, be able to maintain trees in places of drought and paucity of soil.

As ordinary grafting is said to be readily accomplished in conifers the retention of vitality by the stumps and roots might be practically turned to account in silviculture and in forestry, and rotation similar to coppice culture attained by grafting sturdy leaders of felled trees on the living stumps or roots. This might be especially useful in selecting cuttings in protection forests or parklands.

I feel convinced that the phenomenon of the root-graft and overgrowth of stumps of conifers is well worthy of greater study and experimental investigation than has been given to it.

THE LARGER FRESHWATER-CRUSTACEA FROM CANADA AND ALASKA.

By Frits Johansen.

(*Continued from Vol. XXXV, p. 47.*)

III—C. CLAM-SHRIMPS.

This suborder (Conchostraca) is easily distinguished from the two preceding ones by the presence of a double shell enclosing the animal completely (except when swimming) and attached to it dorsally, so that it can be opened and closed like a clam (see p. 45). Conforming with this the body is much compressed, but shows a distinct head-part, sometimes beak-shaped (rostrum) and protruding from the shell. The eyes are sessile and more like those of the "water-fleas" (Cladocera) than those of the fairy-shrimps. In other features also they resemble the Cladocera, and may be considered to stand half way between this group of animals and the Phyllopods. Thus the first pair of antennae are minute, but the second pair developed into long and powerful swimming organs. Of mouth-organs both mandibles and two pairs of maxillae are present; and the short, clumsy body is supplied with from 1 to 2 dozen pairs of foliaceous legs, subdivided both for respiratory and swimming purposes; they also support the female egg-mass dorsally, while the first pair serve with the male as clasping organs ("hand" and "claw"). The posterior body segments have each a pair of spines often present also on the compressed, large, terminal end (telson), which ends in a pair of filaments (cercopods). In size these animals are from a few millimeters to about 2 centimeters long, the *Estheriidae* being the largest forms.

Different from the Cladocera (where the young ones when emerging are very much like the adults) the clam-shrimps hatch as nauplii not unlike those of the fairy-shrimps, though the first pair of antennae are not yet out and the labrum much larger. But the other characters (enormous second pair of antennae and mandibular palps, single, median eye, pear-shaped body with little differentiation of the segments, etc.), are the same as with the other Phyllopods; also (as is the case with the Notostraca-nauplii) the carapace is not yet developed. Gradually it assumes the shape of the adults by the outgrowth of the shell (carapace) on both sides behind the mouthparts, the shortening of the body, reduction of the mandibular-palps, and development of the paired eyes, foliaceous legs, etc., and sexual characters. It should be remembered, however, that of many clam-shrimps the larval stages are very imperfectly known or not known at all.

Their food consists of still smaller invertebrates (Entomostraca, Protozoa, etc.), which they secure by busily swimming around in circles in the water; as a matter of fact when observing them they seem never to be at rest. Their occurrence is extremely puzzling;[1] a water-hole a few feet wide may be teeming with them, whether it is situated in the woods, in a grassy swamp, or on open, dry plains[2]; on the other hand they may be entirely absent from other pools, ponds or lakes in the same place. As is the case with the fairy-shrimps they seem mainly to occur (around Ottawa) in pools or canals left by the overflow of rivers,[3] and are found from April to the time the pools dry up (July). In the summer the females carry their eggs around with them; they are deposited then before the pool they are found in dries up or freezes to the bottom. The females have also (Packard, Sars) been noticed to carry their eggs in the spring (see below).

It is interesting that so far there are no records of them from the high Arctic (except Siberia), though, as mentioned, both fairy-shrimps, tadpole-shrimps and water-fleas have their typical representatives up there. I did not find them on the Canadian Arctic Expedition, nor are they known from Greenland. My identifications of the Conchostraca from the new Can-

[1] Some years they do not show up at all.

[2] The genus **Limnetis** seems to prefer pools with much vegetation.

[3] Or holes filled with water by heavy rains.

adian localities given on the following pages have been verified by Professor A. S. Pearse, of the University of Wisconsin.

Canadian "clam-shrimps" were first described in 1862 by W. Baird from specimens (*Limnetis gouldii*) collected by Ch. Gould in June 1857 at St. Anns, Montreal, P.Q., and from specimens (*Estheria caldwelli*) collected by W. Caldwell in Lake Winnipeg, Man. They are represented upon this continent by three families (subfamilies); the Limnetidae, Limnadiidae and Estheriidae, the two last families being often united by authors. The first family is easily distinguished from the two others by the milky colored shell being more or less spherical and with lines of growth, and the head cannot be retracted into it. In these characters the family reminds one strongly of the Cladocera, especially the family Lynceidae, though the clam-shrimps do not possess the huge claw-foot of these Cladocera. Only one genus (Limnetis, established by Loven in 1845) belonging to this family of clam-shrimps occurs in North America, but it is represented by four species of which three are known only from the United States (*L. mucronatus* occurs in Montana), but one (*L. gouldii* Baird) also in Canada. This latter species is rather hardy and easy to keep in an aquarium; the eggs are found under the back of the shell of the female in the spring and early summer (May-July), according to Packard. It has been recorded from New Hampshire, Massachusetts, Rhode Island, New York and Illinois; from Canada I have before me specimens from the following localities, arranged from east to west:—

About two dozen specimens from a wood beyond Montreal West, P.Q., June 17, 1917, A. Willey, coll. (sent to me from McGill Museum).

Many specimens (the smaller ones reddish, the larger ones, some of which are egg-bearing females, yellow-green [4] collected by myself in a ditch-canal left by the overflow of the Ottawa River on the fields a little east of Gatineau Point, P.Q., June 14, 1919. When I visited this place again on October 19 of the same year the ditch was completely dried up, being filled with *Carex* and much other vegetation; no clam-shrimps were of course observed on that occasion.

On April 18 and May 30, 1920, I again visited the same ditch; but as the water-level of the Ottawa River this year was (even at its maximum) much lower than in 1919, there was no connection between the river and the ditch. The latter had very little water left, merely small holes which contained only some aquatic molluscs, insects, tadpoles, and the Isopod *Asellus communis*. The farmer who owned the field upon which the ditch was situated had ploughed it up and partly filled in the ditch, so the latter will probably never again contain any "clam-shrimps."

On May 2nd, 1921, I collected a number of immature (1½ to 2 cm. long) specimens of this species, in a fairly large and deep pond on a field on the hills at Tenaga, west side of Gatineau River, P.Q. They had a vivid orange or red-brown colour, and were easy to catch as they were swimming slowly ("suspended") in the water, or attaching themselves to plants. They occurred in great numbers, together with Cladocera, Ostracoda, and the fairy-shrimp, *Eubranchipus gelidus*, etc. At the end of May neither fairy-shrimps nor Conchostraca were to be found in this pond.

Mr. W. S. Odell, of Ottawa, tells me that about a dozen years ago he secured many of these clam-shrimps in a pool on the fields at Wychwood (near Aylmer), P. Q., and that he secured more in the same place during the succeeding years (in May). When I visited this pool on May 15, 1921, it was quite dried up, and furthermore used as a dump for rubbish, so that it probably contains no more crustacea. Mr. Odell also secured them in pools alongside the railway-track near Hurdman's Bridge (Rideau River) about a dozen years ago; but for several years their habitat there has been destroyed. Furthermore, for several years Mr. Odell has observed them in the pools left by the overflow (in the spring) of the Rideau River on a pasture at Billings Bridge, Ottawa South, near the brick-yard; and he showed me some he had collected there, together with the fairy-shrimps *Eubranchipus gelidus* of both sexes, on the first week of May, 1921. A week later he and I visited the place, but did not succeed in finding a single fairy-shrimp, though the

[4] Baird describes his specimens, which were 3 x 3 mm. long, as having a pale fleshy-yellowish color, with black eyes.

clam-shrimps, cladocera, ostracods and copepods occurred in great numbers. The *Limnetis* were conspicuous by their orange colour, and both sexes were seen, often in copulation; some of the females had already (May 16) their olive-coloured eggs shining through the shell. The pools in which they occurred I found to be the deeper holes left in the bed of the ditch-canal, much overgrown with water-plants, and with many dead leaves in the bottom from the large oak-trees scattered over the pasture.

The place was visited repeatedly, and all during May the clam-shrimps were found in the larger ponds not yet dried up completely. After a time the red colour of the full-grown individuals changes from orange to brownish, and the egg-bearing females seem to be more numerous than the males, the latter probably dying off rapidly when their function is finished. The two sexes were often seen in copulation, during which process they seem unable to float in the water, but are crawling over the bottom-mud or lying there. By keeping them in a glass of water I observed how during the act the female eventually closes its shell, and the male has all it can do to keep them both free of the bottom. It is a very funny sight: the male moving all its feet vigorously, trying to rise in the water, but the female having the effect of a sinker attached to him, so that the net result is to cause them both to roll over, wrestler-fashion, owing to the globular shape of the body. Sometimes two males would attack one female, but probably this was because so many were crowded together in the bottle.

From June on their numbers decreased markedly; and at the end of the month none were found (the last ones were secured on June 19, when the two sexes were still observed in copulation. Several of these, the last survivors, had a growth of minute, green Algae, etc., upon their shells, a sign of decay). Around Ottawa their life thus seems to last two months. It will be seen, however, from the record of these clam-shrimps from Saskatchewan, given below, that where suitable surroundings are found they may occur also later in the summer.

The weather during April, May and June, 1921, around Ottawa, was very warm, and with practically no rain; it was interesting to observe, that when a period of unusually hot weather arrived in the first half of May, the fairy-shrimps (*Eubranchipus gelidus*) were not to be found any more. I ascertained this by visiting the various pools in which I had found them so common only a few weeks before.

About one dozen specimens from a water-hole on the margin of a wood at Scarborough Junction near Toronto, Ontario, June, 1908, A. G. Huntsman coll. (see *Natural History of Toronto Region*, 1913, p. 275).

Three specimens from pond at Estevan, Sask., August 3, 1916, W. R. Quinn, coll. (sent me from Royal Ontario Museum).

Four specimens, the two largest of which were egg-bearing females, from a slough three miles north-east of Medecine Hat, Alta., June 11, 1920, A. G. Huntsman coll. They occurred together with *Estheria caldwelli*, *Streptocephalus coloradensis* and *Lepidurus couesii*.

One full-grown and three young specimens from a shallow slough at Wetaskiwin (near Edmonton), Alta., June 1, 1920, A. G. Huntsman coll. The fairy-shrimp *Eubranchipus gelidus* was collected in the same slough.

It thus seems as if this species is not found in the Rocky Mountains, nor west of them. It has not been recorded from Alaska, nor did I find it along the arctic coast of this continent west of Bathurst Inlet (Canadian Arctic Expedition).

In size this species does not exceed half a centimeter in length, the females generally being the largest.

Another species (*L. brachyurus*) is known from Scandinavia, Central Europe, Russia and Siberia, and is well described and figured by Sars (1896) p. 117, plates 18-20. He mentions particularly how he only succeeded in finding it in one ditch with much vegetation in Finmark, in August, though he examined carefully many others; he also observed how it swims with the shell-valves wide open, but often sinks to the bottom; and how the males firmly grab the valves of the females below by their "hands" for the purpose of copulation. Some of the larval stages are described by Grube.

To the second family of clam-shrimps belong two genera, *Limnadia* and *Eulimna-*

dia. The shell of the former genus (established by Broignard in 1820), is very broad-ovate, flat and with a great number (18) of lines of growth. So far only one species has been found upon this continent, namely *L. americana,* known from Massachusetts; it may therefore possibly occur also in eastern Canada. Sars (1896) thinks it is the same as *L. lenticularis* Linn. known from Scandinavia and Central Europe; he describes and figures this on p. 85, plates 14-16, and the larval stages on plate 17. He says the females already carried the eggs at the end of July and that the larvae were found in the middle of the same month; he expresses the opinion, however, that only one brood is developed each summer. The size of *L. americana* is about 1 cm. The other genus (*Eulimnadia*) is represented upon this continent by two species of which one is known from Kansas, Nebraska and Texas, and the other, *E. agassizii* [5] from Massachusetts and Ontario. The genus has a narrow ovate, very transparent shell with 4-5 lines of growth about 1-2 cm. long. I have before me four specimens of *E. agassizii* collected by A. G. Huntsman in pools on rocks at Go Home Bay (Georgian Bay) Ont., August 15th (1905), sent me from the Royal Ontario Museum (See *Natural History of Toronto Region,* 1913, p. 275).

Dr. Huntsman writes me (June 1920), that "this species occurred at two places at Go Home Bay, namely at Station Island and at Split Rock Island. In each case a large number of specimens was found in a small, temporary pool in the rock, the pool probably not being more than a foot or two feet in diameter, and quite shallow. It seemed extraordinary that so many individuals of relatively large size should occur in so little water..."

The third family of clam-shrimps (Estheriidae) is represented on this continent by the genus *Estheria* of which more than half a dozen species are known from the United States, but only one, *E. caldwelli* (*Cyzicus mexicana*) [6] from Canada. It is interesting that no species of this genus has so far been found east of Saskatchewan and the Mississippi River. The genus is easily recognized by the oval, more or less globose shell of an amber colour (thus much like a clam-shell) showing about 20 lines of growth until about 1½ cm. long. I have before me five specimens of *E. caldwelli* from a prairie-slough at Estevan, Sask., collected by W. R. Quinn on August 6th, 1916, and sent me from the Royal Ontario Museum. The species was first described in 1862 by W. Baird from specimens collected by W. Caldwell in Lake Winnipeg, and two years earlier by C. Claus from Mexico; it has further been recorded from Kansas, Nebraska, Kentucky, Ohio and New Mexico.

I have recently received one more specimen collected by Dr. A. G. Huntsman on June 11, 1920, in a slough three miles north-east of Medicine Hat, Alta., where it occurred together with *Limnetis gouldii* and other Entomostraca. The specimen is about 9 mm. long, while some of the five specimens from Estevan, Sask., mentioned above were almost double this size.

Clam-shrimps were recorded from Finland by Linnaeus; but the order was well-described for the first time by Herman in the beginning of the nineteenth century.

POSTSCRIPT.

In June, 1920, I received a letter from Dr. Chancey Juday, of Madison, Wisconsin, giving me some new records of clam-shrimps collected by J. M. Jessup in May-July, 1911 and in July, 1912, in Alaska and Yukon Territory.

As these are the first records of Conchostraca from the arctic and subarctic parts of this continent, and the first time the two species in question have been found in America, it is of importance to have them included in this article. The records are:

Lynceus brachyurus (*Limnetis b.*):—Lakes and bog-holes on Old Crow River flat about 40 miles north of New Rampart House; Lake 48 miles north of New Rampart House; Morainal lakes, 30-35 miles north of White Horse, Yukon Territory.

Limnadia lenticularis:—Lakes on coastal

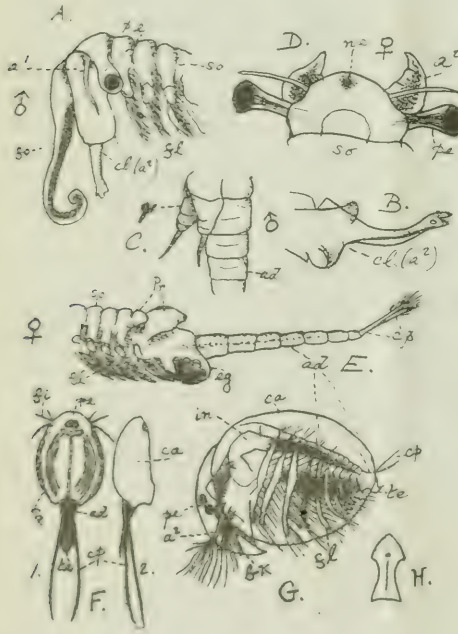
[5] First described (and the genus established) by Packard in 1874, from specimens collected by W. Faxon in Massachusetts in 1873; the females had then (August) yellowish eggs. The following July-August the young ones were about 1 line in length.

[6] The genus-name Estheria was made by Rueppell, in 1857, but later the genus was found to be the same as Audouin's Cyzicus, established in 1837. Similarly Baird's species **E. caldwelli,** described in 1862, has been proved to be the same as **C. mexicanus,** first described by Claus two years previously.

plain of Arctic Ocean (about 69° 40' N., 141° W.); isolated pond off Old Crow River.

Both of these species have been already mentioned in this article.

Note.—I have been unable to find any popular, English names for Notostraca and Conchostraca, and am therefore in these articles proposing the names of "tadpole-shrimps" and "clam-shrimps" for them. To distinguish the "clam-shrimps" from the Ostracoda I propose for the latter the name of "mussel-shrimps", a translation of the popular, Danish name for the Ostracoda. The difference in the shape of the shell between the Conchostraca and the Ostracoda is thus indicated in these popular names. The popular Danish name for Notostraca (Apodidae) means "pond-ray"; but I think it better to use a popular English name for them which indicates the class of animals to which they belong.



A-E: Eubranchipus gelidus Hay; F: Lepidurus couesii Pack; G-H: Limnetis gouldii Baird. Above letters explained: fo: frontal organ; a^1 first pair of antennae; a^2 (cl): 2nd pair of antennae (or claspers); ne: nauplius-eye; pe: paired eyes; fi: filaments of 1st pair of feet; so: bodysegments (somites); fl: foliaceous legs; ca: carapace (or shell); bk: beak of head; in: intestine; pr: processes from somites; eg: eggsack with eggs; ge: male genitalia; ad: abdomen; te: telson; cp: cercopods. (A and E, after Pearse; F-H, after Packard; B-D, Originals.) A, C, E, F^2, G are lateral views; D and F1: dorsal views; B: clasper from inside; H: front view of head.

BIBLIOGRAPHY FOR CANADIAN AND ALASKAN EUPHYLLOPODA.

Muller, O. F.—*Zoologia Danica Prodromus, Vol.* II, Hafniae, 1777.

Fabricius, O.—*Fauna Groenlandica,* etc., Hafniae et Lipsiae, 1780, p. 247.

Pallas, M. P. S.—*Voyage en différentes provinces de l'Empire de Russie,* etc. *Vol.* IV, Paris, 1793.

Kroeyer, H.—Groenlands Amphipoder (*Vid. Selsk. Skr., naturv. og mathem.* Afh. VII, Kbhvn., 1838).

Kroeyer, H.—Conspectus Crust. Groenl. (*Naturh. Tidsskr.* II Raekke, 2, Khvbn. 1847).

Fischer, S.—Branchiopoda et Entomostraca (*Middendorf's Sibirischer Reisen,* II, 1, St. Petersbourg, 1851.

Baird, W.—Monograph of the family Apodidae, etc.——Monogr. of the family Branchipodidae, etc. (*Proc. Zool. Soc.,* London, 1852).

Baird, W.—Description of several new species of Phyllopodous Crustac. (*Proc. Zool. Soc.,* London, 1862).

Grube, A. E.—Bemerkung ueber die Phyllopoden, etc. (*Arch. f. Naturgesch.,* 19 Jahrg., 1853).

Reinhardt, J.—Fortegnelse over Groenlands Krebsdyr, etc. (In H. Rink, *Naturh. Tillaeg til en geografisk og statist. Beskriv. af Groenland,* Kbhvn., 1857).

Claus, C.—Ueber die Estheriden, inbesonders ueber *E. mexicana* (*Beitr. zur Kenntn. der Entomostr.* 12-25, 1860).

Verrill, A. E.—Descript. of some new Amer. Phyllopod Crust. (*Amer. Journ. Science and Arts,* 2d. Series, 1869).

Verrill, A. E.—Observat. on Phyllopod Crust. of the family Branchipidae, etc. (*Proc. Amer. Assoc. Adv. Science,* Salem, 1869; Cambridge, 1870).

Packard, A. S.—Observ. on glacial phenom. of Labrador and Maine, etc. (*Memoirs of Boston Soc. Nat. Hist.,* I, 1867).

Packard, A. S.—Synopsis of the Freshwater-Phyllopod Crust. of North America (*U. S. Geol. and Geograph. Survey of Colorado,* 1873).

Packard, A. S.—Descript. of a new Phyllopod Crust. from the West (*Bull. U.S. Geolog. and Geograph. Survey of Territories,* Vol. III, No. 1, 1877).

Packard, A. S.—Descript. of new N. A. Phyllopoda (*Ann. Rep. Peabody Acad. of Sciences for* 1873 (1874)).

Packard, A. S.—Monograph of the Phyllop. Crust. of North America (U. S. *Geol. and Geograph. Survey of Wyoming and Idaho,* Part I, Wash., 1883).

Packard, A. S.—New Phyllop. Crust. (*Amer. Nat.* Vol. IX, 1875).

Packard, A. S.—Explorat. Polaris Exp. (*Amer. Nat.,* Vol. XI, 1877).

Packard, A. S.—Notes on Phyllop. Crust. (*Amer. Nat.,* Vol. XIV, 1880).

Miers, E. I.—Arctic Crustaceae (*Annals and Magaz. of Nat. Hist.,* Ser. 4, Vol. 20, 1877; Appendix to *Narrative of a Voyage to the Polar Sea,* 1875-76, Vol. II, 1878).

Murdoch, J.—Marine Invertebrates (exclusive of mollusks) (*Report of the International Polar Expedit. to Point Barrow, Alaska,* Washington, 1885).

Murdoch, J.—Descript. of seven new species of Crustacea and one worm from Arctic Alaska (*Proc. U. S. Nat. Mus.,* Vol. VII, 1884).

Simon, E.—Etudes sur les Crust. du sous-ordre des Phyllopodes (*Annal. Soc. Entomol. de France,* Série 6, Vol. 6, Paris, 1886).

Lilljeborg, W.—Contrib. to the Nat. Hist. of Commander Islands, 9 (*Proc. U. S. Nat. Mus.,* Vol. X, 1887).

Hansen, H. J.—Crustacea (*"Dijmphna" Ekspeditionens zoolog. og botan. Udbytte,* Kbhvn., 1887).

Hay, O. P. and W. P.—A Contrib. to the knowledge of the genus Branchipus (*Amer. Nat.,* Vol. XXIII, 1889).

Wesenberg-Lund, C. — Groenlands Fersk-vands-Entomostraca, I, Phyllopoda, branchiopoda et cladocera (*Videns-kab. Medd. Naturh.* Foren, Kbvn., 1894).

Wesenberg-Lund, C.—Fersk-og Saltvands-Entomostraca fra Ryder Eksped. (*Medd. om Groenl.,* Vol. 19, 1896).

Halkett, A.—Ottawa Phyllopods (*Ottawa Naturalist,* July, 1895).

Halkett, A.—A Naturalist in the Frozen North (*Ottawa Naturalist,* Aug. 1905).

Prince, E. E.—Remarkable points in the life-history of Phyllopods (*Ottawa Naturalist,* 1896).

Sahlberg, J.—Om Finlands hittils kända Phyllopoder, etc. (*Notitser ur Sallsk. pro Fauna ed Flora Fennica,* Forh. XIV).

Sars, G. O.—Oversigt af Norges Crustaceer, Estheriidae (1887) and Branchiopoda, etc. (1890), Kristiania, (*Vid. Selsk. Forh.*).

Sars, G. O.—*Fauna Norvegiae.* I, Phyllocarida et Phyllopoda. Kristiania, 1896.

Sars, G. O.—Phyllopoda of the Jana Expedition (*Annuaire de Mus. Zool. de l'Acad. des Sciences,* St. Petersbourg, 1897).

Sars, G. O.—Crustacea. (*Rep. 2nd Norweg. Arctic Exp.* 1898-1902, No. 18, 1909).

Vanhoeffen, E.—Die Fauna und Flora Groenlands (*Groenl. Exp. der Gesselschaft. für Erdkunde,* Berlin, 1897).

Daday de Dées, E.—*Branchipus paludosus* O. F. Muell. in der ungarische fauna (*Termeszetraji Fuezetek,* Vol. 13, 1890).

Daday de Dées, E. — Monogr. syst. des Phyllopodes Anostracés, Vol. 11, 1910 (*Annales des Scien. Natur., Zoologie,* Série 9).

Daday de Dées, E. — Monogr. syst. des Phyllopodes Conchostracés. Vol. 20, 1915. (*Annales des Sciences Natur., Zoologie,* Série 9).

Daday de Dées, E.—*Polyartemiella judayi,* novum genus novaque species, etc. (*An. Mus. Nat. Hung.,* 1909).

Zschokke, F.—Die tierwelt in den Hochgebirgseen (*Neue Denkschr. d. allgemein. schweiz. Gesselsch. f. d. gesammt. Naturwiss.,* Bd. 37, Zurich, 1900).

Ortman, A. E.—Crustacea and Pycnogonida coll. during the Princeton Exp. to N. Greenland (*Proc. Acad. Nat. Scien.,* Philadelphia, 1901).

Ekman, S. — Beitrage z. Kenntn. d. Phyllopodenfamilie Polyartemiidae (*Bihangt. Kgl. Svenska. Vet. Akad. Handl.*, Bd. 28, Afd. IV, No. 11, Stockholm, 1902).

Ekman, S.—Die Phyllopoden, Cladoceren und freileb. Copepoden der nordswed. Hochgebirge (*Zool. Jahrb.* Abt. f. System, Bd. 21, 1905).

Shantz, H. L.—Notes on the N. A. species of *Branchinecta* and their habits (*Biolog. Bull.* 9, 1905, *Zool. Stud. Univ. of Nebr.*).

Howland, R. B.—Migration of retinal pigment in the eyes of *Branchipus gelidus* (*Journ. Experim. Zool.*, 2, 1911).

Johansen, F.—Freshwater-life in N. E. Greenland (*Medd. om Groenland,* Vol. 45, 1911).

Brehm, V.—Die Entomostraken der Danmark Exped. (*Medd. om Groenl.* Vol. 34, 1911).

Cockerell, T. D.—The fauna of Boulder Co., Colorado, II (*Univ. of Colorado Studies*, Vol. IX, 2-3, 1912).

Huntsman, A. G.—Invertebrates (*Nat. Hist. of Toronto Region*, Toronto, 1913).

Pearse, A. S.—Notes on Phyllopod Crustacea (*14th Rep. Mich. Acad. Scien.*, 1912).

Pearse, A. S.—Notes on Crustacea recently acquired by the museum (*Occas. Papers from Mus. of Zool., Univ. of Mich.*, 1913).

Pearse, A. S.—Phyllopoda (Ward and Whipple's *Freshwater-Biology,* New York, 1918).

Dodds, G. S.—Descript. of two new species of Entomostraca from Colorado (*Proc. U. S. N. M.*, Vol. 49, Washington, 1914).

Dodds, G. S.—Key to the Entomostraca of Colorado (*Univ. of Col. Studies,* Vol. XI, 1915).

Dodds, G. S.—Altitudinal Distribution of the Entomostraca in Colorado (*Proc. U. S. N. M.*, Vol. 54, 1917).

Haberbosch, P.—Ueber arktische Suesswasser-Crustaceen (*Zool. Anzeig.* Bd. 47, 1916).

Stephensen, K.—Conspectus Crust. et Pygnog. Groenland. (*Medd. om Groenl.* Vol. 22, 1917).

Olofsen, O.—Studien ueber d. Suesswasserfauna Spitzberg, etc. (*Inaug. Dissert., Zool. Bidrag fr. Uppsala,* Bd. VI, 1918).

(Concluded.)

NOTES ON THE FAUNA OF LOWER PAGWACHUAN, LOWER KENOGAMI AND LOWER ALBANY RIVERS OF ONTARIO.

BY M. Y. WILLIAMS, University of British Columbia, Vancouver.

The following observations were made between July 25th and September 16th, 1920, while on a geological trip along the river route between Pagwa on the National Transcontinental railway and Fort Albany on James Bay. A side trip was also made 25 miles up Albany River from the Forks. The route is along rivers of the Albany system and falls into three main divisions, — the Pagwachuan River, estimated distance 35 miles; the Kenogami River from the mouth of the Pagwachuan River to the Forks of the Albany River, estimated distance 85 miles; the lower Albany River from the Forks to James Bay, estimated distance 150 miles. English River post, formerly known as Mammawemattawa, occupied by traders of the Hudson's Bay and Revillon Frères fur companies, is about 25 miles below the mouth of the Pagwachuan River and at the junction of the Kabinakagami and Kenogami Rivers. The Nagagami River enters the Kenogami about one mile higher up. Both fur companies mentioned have posts at the mouth of Chipie (Ghost) River about 50 miles below the Forks of the Albany, and the Hudson's Bay, the Revillon Frères and the James

Bay Company have posts at Fort Albany, the last recently established; a large Roman Catholic mission is also situated there. The estuary of the Albany River is about 16 miles long and is composed of many islands, the largest, Albany Island, being about seven or eight miles long and about one-half as wide. Near the middle of the south side of this island the settlements are established. Tide water extends to the head of Albany Island.

The river flows across a plain which slopes toward James Bay at less than two feet per mile. For about ten miles below the steel, the Pagwachuan flows through boulder clay overlain by silts and sand, the latter rising into hills and ridges. For this distance the bedrock is pre-Cambrian in age and is seen by outcrops of grey granite in the river bed. To the north the crystalline rocks are overlain by Palaeozoic limestones and shales, and across this sedimentary basin, the country, as seen from the rivers, is a monotonous muskeg dotted with stunted black spruce. The floor is of sphagnum moss, laurel and Labrador tea. The river valleys give variety in vegetation and topography, their terraces being commonly covered with fair stands of white spruce, white birch, white and balsam poplar, and scattered cedar, tamarack, ash and jackpine. Isolated stands of ash and elm occur at the junction of the Kabinakagami and Kenogami rivers, and on the latter river near the mouth of Little Current River. Red osier dogwood and willow grow along the river flats.

BIRDS.

Loon, *Gavia imber*. Two seen in the estuary of the Albany River, August 18th.

Herring Gull, *Larus argentatus*. One seen at mouth of Pagwachuan River, August 5th. Two immatures seen at Forks of Albany, August 12th. Several seen each day between the Forks and the estuary of the Albany, August 13th — August 18th. On lower Albany adult birds seen August 24th, 27th and Sept. 1st. Immature birds seen August 18th, 25th, 28th, 31st, Sept. 5th and one at the mouth of the Pagwachuan, September 13th.

Common Tern, *Sterna hirundo*. Several seen in the Albany estuary, August 18th and 24th. Several were seen at Fishing Creek Island[1], August 26th.

American Merganser, *Mergus americanus*. Birds probably of this species were observed as follows: — two at mouth of Pagwachuan River, August 5th; a flock at Fort Albany, August 20th; eight at Hat Island[2], August 31st.

Mallard, *Anas boschas*. Five seen in the hands of Indian hunters, at Albany, August 21st. They were killed along the coast to the west of the river.

Black duck, *Anas obscura*. One seen in Albany estuary, August 18th; several seen in the hands of Indian hunters at Fort Albany, August 20th.

Golden-eye, *Clangula clangula*. Two seen at mouth of Pagwachuan River, August 5th; five ducks probably of this species near Snake Island[3], August 14th.

Canada Goose, *Branta canadensis*. Seen as follows: — At Fishing Creek Island, Albany River, five seen on August 17th; in estuary of Albany, twelve seen on August 18th and again on 19th; a flock seen at Fort Albany, August 21st; twelve in the estuary, August 26th; twelve at the mouth of Ghost (Chipie) River[4], August 30th; twelve at Hat Island, August 31st; a flock 20 miles up the Albany from Forks, Sept. 3rd.

Wilson Snipe, *Gallinago delicata*. One seen at the Forks of the Albany, Sept. 2nd, and one about 30 miles above the Forks, September 5th.

Semipalmated Sandpiper, *Ereunetes pusillus*. Birds probably of this species seen as follows: — August 1st, two near mouth of Pagwachuan River; flocks near the mouth of Chipie River, August 14th, 15th and 16th; their notes heard at the Forks of the Albany, Sept. 4th and 5th.

Greater Yellow-legs, *Totanus melanoleucus*. Generally common from the mouth of the Pagwachuan River to Fort Albany between August 3rd and September 6th, after which none were observed. Two old birds flew back and forth past our camp at the mouth of the Pagwachuan, August

[1] About 50 miles up the Albany.

[2] About 35 miles below the Forks of the Albany River.

[3] About 16 miles below the Forks of the Albany River.

[4] 50 miles below Forks.

3rd to 5th, screaming and apparently trying to lure us away from their young, which appeared to be running about on the gravel bars at the far side of the river. Two were taken at Snake Island on August 13th.

Solitary Sandpiper, *Helodromas solitarius.* Two birds probably of this species seen 10 miles below railway on Pagwachuan River.

Spotted Sandpiper, *Actites macularia.* Common throughout trip.

Semipalmated Plover, *Ægialitis semipalmata.* One seen near Chipie River, August 16th; several seen at Forks of Albany, September 2nd.

Ruffed Grouse, *Bonasa umbellus.* One seen at the Forks, Sept. 2nd., and one at Pagwa, Sept. 16th.

Marsh Hawk, *Circus hudsonius.* Nine seen between Snake Island and the estuary of the Albany River, August 14th-26th. Two seen at the Forks, Sept. 2nd, and two thirty miles up the Kenogami, Sept. 6th.

Cooper's Hawk, *Accipiter cooperi.* One seen at Albany estuary, August 25th, and one at Fishing Creek, August 27th.

American Goshawk, *Accipiter atricapillus.* One female shot 30 miles above Forks on Kenogami River, Sept. 5th. Three seen between this point and English River post, Sept. 5th.

Red-tailed Hawk, *Buteo borealis.* Seen as follows: — Five on Kenogami River below English River post, August 11th; one at estuary of Albany, August 24th; one at Sand Cherry Island[5], August 27th; four at the Forks, Sept. 2nd; two twenty miles above Forks on Albany River, August 3rd; two on Kenogami River, 30 miles above English River post, Sept. 6th; one on Kenogami River, 17 miles above English River post, Sept. 10th; one at the mouth of Pagwachuan, Sept. 13th, and one near Pagwa, Sept. 15th.

Broad-winged Hawk. *Buteo platypterus.* One seen about six miles above mouth of Pagwachuan River, July 31st.

Pigeon Hawk, *Falco columbarius.* Two seen at Hat Island, Albany River, August 31st, and two, on Sept. 3rd, 20 miles above Forks on Albany River.

Sparrow Hawk, *Falco sparverius.* One seen at Pagwachuan River, July 29th; two seen at Snake Island, Albany River, August 14th.

American Osprey, *Pandion haliaetus carolinensis.* One seen at estuary of Albany, August 18th and again August 25th. Five seen at Henley River six miles below the Forks, Sept. 1st; two seen on the Albany River a few miles above the Forks, a female being collected; one seen at the Forks, Sept. 5th.

Short-eared Owl, *Asio accipitrinus.* Very common every evening spent at Fort Albany. Six seen August 19th, ten on the 21st, two being collected.

Great Horned Owl, *Bubo virginianus.* One heard July 30th on Pagwachuan River. One seen on same river July 31st. One heard at Hat Island, August 31st.

Belted Kingfisher, *Ceryle alcyon.* Seen occasionally as far down as the head of the estuary of the Albany, 20 birds being counted in all.

Hairy Woodpecker, *Dryobates villosus.* One seen on Pagwachuan River, July 30th; two seen on Hat Island, August 31st; one heard at English River post, Sept. 7th.

Arctic Three-toed Woodpecker, *Picoides arcticus.* One seen 20 miles above the Forks on Albany River, Sept. 3rd.

American Three-toed Woodpecker, *Picoides americanus.* One seen at head of Albany estuary, August 19th, and at Fort Albany, August 21st.

Flicker, *Colaptes auratus.* One seen near mouth of Pagwachuan River, August 1st; one heard at English River post, August 9th, and one seen August 10th; two seen at Forks of Albany, August 13th; one seen on Pagwachuan River on Sept. 14th and one on 15th.

Night Hawk, *Chordeiles virginianus.* Fairly common on Kenogami river between the mouth of the Pagwachuan River and the Forks of the Albany from August 3rd to 12th; one seen at the head of the Albany estuary, August 18th.

Olive-sided Flycatcher, *Nuttalornis borealis.* Heard on August 8th and 10th at English River post, and one seen there August 9th.

Horned Lark, *Otocoris alpestris.* One seen at Fort Albany, August 21st; thirty seen on Albany River 20 miles above the

[5] 75 miles above mouth of Albany.

Forks, September 3rd; five seen at mouth of Pagwachuan River, Sept. 13th.

Canada Jay, *Perisoreus canadensis.* Heard on Pagwachuan River, July 26th and 27th; common throughout rest of trip.

Raven, *Corvus corax.* Noted as follows: Two at English River post, August 10th; a flock at Fishing Creek Island, August 16th; two at estuary of Albany, August 18th; on return trip five single birds were seen between Hat Island and 17 miles above English River post on the Kenogami River, August 31st to September 10th.

Red-winged Blackbird, *Agelaius phoeniceus.* One immature male taken 20 miles above English river post, Sept. 9th.

Rusty Blackbird, *Euphagus carolinus.* Two seen on Pagwachuan river, August 30th; a flock seen at the Forks of the Albany, September 2nd; eight seen on the Pagwachuan, Sept. 15th.

White-winged Crossbill, *Loxia leucoptera.* The commonest bird seen on the trip July 25th to Sept. 16th, and their twittering flight song was heard every day between the steel and Fort Albany. Three males were taken at Pagwa, July 28th.

American Goldfinch, *Astragalinus tristis.* Birds probably of this species seen at the Forks and at Fishing Creek Island, August 12th and 17th.

White-throated Sparrow, *Zonotrichia albicollis.* Heard at Fort Albany, August 23rd; common between the Forks and the mouth of the Pagwachuan River, September 2nd to 14th.

Junco, *Junco hyemalis.* Several seen at the Forks, Aug. 13th; several seen almost every day between Fort Albany and Pagwa, Aug. 22nd to Sept. 13th.

Song Sparrow, *Melospiza cinerea.* Several seen at mouth of Pagwachuan, August 5th; one at English River post, August 8th; two doubtfully of this species near English River post, Sept. 9th; several at the mouth of the Pagwachuan, Sept. 13th, and several 10 miles farther up, Sept. 15th.

Fox Sparrow, *Passerella iliaca.* One seen each day Aug. 20-23rd at Fort Albany.

Tree Swallow, *Iridoprocne bicolor.* Several seen at mouth of Pagwachuan, August 5th.

Cedar Waxwing, *Ampelis cedrorum.* Common along Pagwachuan from Pagwa to its mouth, July 25th to August 4th; one seen at English River post, August 9th, and one at estuary of Albany River, August 18th.

Black and White Warbler, *Mniotilta varia.* One seen at mouth of Pagwachuan, August 4th.

Oven Bird, *Seiurus aurocapillus.* One heard at mouth of Pagwachuan River, July 25th.

American Redstart, *Setophaga ruticilla.* Three seen at mouth of Pagwachuan River, August 4th.

American Pipit, *Anthus pennsylvanicus.* Common at the Forks of the Albany and 20 miles up both the Albany and the Kenogami, Sept. 1st to 5th. Several seen on Kenogami 10 to 20 miles above English River post, Sept. 10th.

Hudsonian chickadee, *Penthestes hudsonicus hudsonicus.* Heard at English River post, August 22nd; several seen at Noran Island[6], August 29th; fairly common 20 miles up Albany from Forks and up Kenogami to mouth of Pagwachuan, Sept. 2nd-13th.

White-breasted Nuthatch, *Sitta carolinensis.* Note doubtfully identified at Fishing Creek, August 27th, and identified with certainty at the Forks, Sept. 2nd.

American Robin, *Planesticus migratorius.* One seen near mouth of Pagwachuan River, August 1st; one seen at Forks of Albany, August 21st.

MAMMALS.

Drummond's Vole, *Microtus drummondii* (Audubon and Bachman). Taken at Fort Albany, August 23rd.

White-footed Mouse, *Peromyscus maniculatus maniculatus* (Wagner). Taken at Fort Albany, August 23rd.

Hudson Bay Jumping Mouse, *Zapus hudsonius hudsonius* (Zimmermann). At the mouth of the Pagwachuan River, August 4th.

Black Bear, *Ursus americanus americanus* Pallas. Fresh signs seen in Albany estuary, August 23rd.

Grey Wolf, *Canis occidentalis* (Richard-

[6] Noran Island is situated about four miles below Chipie River, 54 miles below the Forks of the Albany.

son). Two young wolves were held in captivity at the Catholic Mission at Fort Albany. A large grey animal accompanying two jet black ones appeared on the shore of Albany River about 12 miles above the Forks, Sept. 4th. The grey one appeared to be a wolf, the other two may have been Indian dogs, but pure black dogs are rare.

Northern Chipmunk, *Eutamias quadrivittatus borealis* (Allen). Common from mouth of Pagwachuan River to English River post, August 5th to 9th.

Hudson Bay Squirrel, *Sciurus hudsonicus hudsonicus* (Erxleben). Common along whole route.

Muskrat, *Ondatra zibethica* (Linnaeus). Remains abandoned by Red-tailed Hawk (sp.?), as we approached, about 10 miles above Forks on Albany River, Sept. 3rd. One seen on the Kenogami River, Sept. 6th.

Northern Hare, *Lepus americanus americanus* Erxleben. Conspicuous by their absence. Some signs seen.

Moose, *Alces americanus* Jardine. Tracks commons along Pagwachuan River.

A calf passed close to our camp in the early morning on the Kenogami River a few miles below the mouth of the Pagwachuan River, August 5th. Saw a cow on Kenogami River about 15 miles below English River post, August 11th.

Virginia Deer, *Odocoileus americanus borealis* Miller. One reported shot on Pagwachuan River late in July. Indians had deer meat at Fishing Creek Island, August 17th.

BATRACHIANS.

American Toad, *Bufo lentiginosus*. Common along Kenogami and Albany Rivers as far as Fort Albany, August 6th to 31st.

FISH.

Lake Sturgeon, *Acipenser rubicundus*. Five taken in one net at mouth of Chipie River, August 14th. Reported very common here.

Sucker, *Moxostoma*, sp.? Two taken in our net at mouth of Chipie River, August 14th. These are the commonest fish along the rivers traversed.

NOTES AND OBSERVATIONS.

AN AQUATIC HABIT OF THE PIGEONS.

For a terrestrial bird to exhibit any aquatic habit, even though rarely, would seem to be of interest and perhaps may have an obscure significance.

Some twelve years ago, I think it was, on a very warm summer day, I was canoeing on Lake Ontario near Toronto Bay. About three domestic pigeons (*Columba livia*, var.?) circled once near me, lit gracefully on the calm surface of the lake, remained there for a few seconds during which time I believe they drank, and then rose easily and flew away toward the city.

Never having seen or heard of such a performance by pigeons, I was surprised to the point of incredulity. Mr. C. W. Nash was told of the incident and recollected seeing pigeons light on Ashbridge's Bay on one occasion. He believed at first that they had lit on floating weeds, but he decided later that the water was deep at the point in question.

Mr. R. L. Strothers reported to Mr. Nash that he had shot at an unknown bird as it rose from his trout-pond where it had alighted to drink, and was much surprised to find that he had killed a Carrier Pigeon, one of the races of the domestic pigeon.

Harting[1] mentions that Wood Pigeons (*Columba palumbus*) and domestic pigeons have this habit, and as he is one of the few observers who mention it the item is worth quoting.

> "In very hot weather Wood Pigeons (as well as house pigeons) may be seen alighting occasionally on the surface of water to drink, and after a few seconds flying off again (*Field*, June 26 and July 3, 1875)."

So far as I am aware most writers on the Passenger Pigeon (*Ectopistes migratorius*) make no reference to this species

[1] Harting. **Handbook of British Birds**, p. 124.

drinking from the surface of the water. W. A. Linkletter[1] writing in Rod and Gun records some interesting notes which show that the Passenger Pigeon also drank from the surface of the water.

The apposite portion of his article is quoted below:

"I wish to mention several peculiarities which I deem no other variety of birds have. Having lived with them for thirty years I had an opportunity to learn things about them which few people ever enjoyed. And of the numerous articles which I have seen in print in regard to them, none of the writers mentioned any of the peculiar capers which the pigeons cut. Although they were not water-fowl, if there was no other way to get to the water they would light on the water with their wings half spread and after drinking they would clear the water at one flap of the wings."

This observer notes an important point — the wings were "half spread", doubtless to keep them dry. His evidence is that this species also alighted on the surface and did not drink while hovering over it, for he says: "After drinking they would clear the water with one flap of the wings."

To sum up, the domestic pigeon (which is descended from the Rock Dove of Europe) and the Wood Pigeon of Europe, exhibit, and the Passenger Pigeon of North America exhibited, even if rarely, the habit of alighting upon water to drink.

Perhaps observation will show that many other species of the great Order Columbae have similar habits.

The occurrence of this habit in the genera *Ectopistes* and *Columba* shows that it is wide-spread. Have these different species all acquired such a curious habit independently or has it an ancient foundation? Habits may be more or less transient and the habit of the pigeons under discussion is too rare to warrant specific conclusions, but it should not be forgotten that many groups of birds which are considered as related to the Pigeons are aquatic.

Pycraft[2] shows the following groups allied with the Pigeons in the Charadriiformes (Plover-like birds). The groups may be separated as follows:—

Terrestrial.

Turnix (European and Australian Quail), Columbi (Pigeons), Pterocles (Sand Grouse).

Aquatic.

Thinocorys (Seed-Plovers), Glareoli (Coursers), Chionis (Sheath-bills), Dromas (Crab-Plovers), Alcidae (Auks), Lari (Gulls), Oedicnemidae (Stone-Curlews), Charadrii (Plovers).

HOYES LLOYD.

[1] Rod and Gun in Canada, December, 1920, p. 754.

[2] A History of Birds, Chap. III, p. 41.

FRESHWATER CRUSTACEA FROM CANADA.

Additional specimens of *Gammarus limnaeus* from British Columbia (see Vol. XXXIV, p. 130), have been received from Mr. and Mrs. T. L. Thacker, of Little Mountain, Hope, B. C. They comprise very young and half-grown individuals from the following localities:

Little Mountain, Hope, B. C., March-April, 1918.

Sucker Creek, Hope, B. C., July 30, 1921.

Nicomecal River, and two small creeks running into it, about one-half mile south of Langley Prairie Station, B. C., August 5, 1921.

In the article referred to above, p. 128, I stated that another amphipod, *Pontoporeia affinis*, had so far only been found in the sea. Dr. Chancey Juday, of the University of Wisconsin, Madison, tells me in a letter that the species (identified by Prof. G. O. Sars of Christiania) is common in Green Lake, Wisconsin, and has been found also in certain lakes in New York State. Equally interesting is its occurrence in the deeper parts of certain large lakes in the Scandinavian countries (Denmark, Norway, Sweden), and in Russia, where it is generally considered (see e.g. Wesenberg-Lund, in *Kgl. Danske Videnskab. Selsk. Skrift.*, 1902 and 1917) a typical, glacial relict-form, in the same way as the schizopod, *Mysis relicta* Loven, also occurring there and in certain lakes upon this continent (see H. L. Schmitt, in *Rep. Can. Arctic Exped.* 1913-18, Vol. VII, Part B, p. 3). Some recent authors think it more probable that neither *Pontoporeia affinis* nor *Mysis relicta* are "rel-

icts," but have immigrated to the lakes they now inhabit, at the end of the glacial period.

The records of *Pontoporeia affinis* from salt water include the north coast of Alaska (Canadian Bay), the Gulf of St. Lawrence, the North Atlantic south to France, besides the Kattegat, Baltic and Kara Seas (see *Rep. Can. Arctic Exped.*, Vol. VII, Part E, p. 10).

FRITS JOHANSEN.

ADDITIONAL SPECIES FOR THE LIST OF COLDSTREAM BIRDS.

(Continued from Vol. XXXIV, p. 53.)

195. *Empidonax virescens.* — Acadian Flycatcher.
Took a male on May 26, 1921, being the first record for this country.

196. *Hesperiphona vespertina,* — Evening Grosbeak.
On Jan. 5, 1919, a flock of nine appeared here, some of which remained until the end of the month. Also located a flock of twenty-five which had roosted in spruce trees on a farmer's lawn for nearly two weeks. Several birds were noticed working around basswood seeds, but all stomachs examined contained only maple seeds.

197. *Bombycilla garrula,* — Bohemian Waxwing.
Secured two males here, Jan. 30, 1920. R. T. Hedley records a flock of sixteen on Feb. 3, a few miles south of here, and a large flock two miles east of Duncrief, the week before.

198. *Dendroica vigorsi,* — Pine Warbler.
Took a male June 9, 1920.

199. *Seiurus motacilla,* — Louisiana Water Thrush.
A male taken by W. R. Campbell, four miles west of Coldstream, June 2, 1913.

200. *Penthestes hudsonicus,* — Hudsonian Chickadee.
A male taken Oct. 31, 1919, and a female, Nov. 28. The only individuals noted here. Their notes and actions were very much slower than *atricapillus.*

A. A. WOOD.

STARLING AT LONDON.

On the morning of May 15th, 1921, several members of our Bird Club motored to Port Stanley to spend a few hours with the birds. We found them very numerous and in the sheltered nooks the air was full of song. The principal item of interest was the finding of three Starlings along the lake front. Our attention was called by their harsh guttural notes; although they flew away several times, they always returned to the tall dead tree where we first noticed them. This is the first record for the Starling for our vicinity.

We have another interesting visitor to report in Henslow's Sparrow. It was first noticed on May 4th and remained in the same field for ten days. In fact it may still be there, but we were unable to catch its insignificant "song" on our last visit or two to the field on account of the number of Bobolinks, Kingbirds and Goldfinches that were flying about and filling the air with a babel of song. This is the second record for London (one having been heard last spring), and the bird has only been reported from some three other places in Ontario.

E. M. S. DALE, London, Ont.

THE CANADIAN FIELD-NATURALIST

VOL. XXXV. GARDENVALE, QUE., September 1921 No. 6

ON A NEW HELIOZOON FROM VANCOUVER ISLAND

By Chas. H. O'Donoghue, D.Sc., F.Z.S.,

Professor of Zoology, University of Manitoba.

(From the Biological Station, Nanaimo, B.C.)

On the 25th of May Mrs. Edith Berkeley brought in some water, mud and debris from a small pond near the top of a hill above Hammond Bay Lagoon, about 420 feet above sea level. In this she noticed a very large Heliozoon, which she kindly handed to me for examination.

The pond is quite small and shallow, surrounded by a close growth of alders, and is apparently permanent. It contains a plentiful supply of several species of Algae (*Spirogyra*, etc.), numerous fly larvae, beetles and larvae, Copepods, Cladocera, and *Hydra viridis* and a number of flagellate forms.

The available literature has not yielded a description of a similar form nor is there anything like it in Wailes' excellent monograph number of this order (1) or Leidy's account of the Freshwater Rhizopoda of North America. As the present organism is remarkable in several respects, it seems worthy of putting on record.

The animal is of very large size and appears to the naked eye as a bright green sphere with a hyaline cover 2mm. in diameter; indeed, it was so large that it was at first thought that it might be a colony. Closer examination showed that this was not the case and that it was a solitary form, so that it is probably the largest Heliozoon known, the only one approaching it being *Actinosphaerium eichhornii*, which may attain a diameter of 1mm. It belongs to the sub-order Chalarothoraca in which the largest member is probably *Raphidiophrys viridis*, which may reach 90 micra or the colony 190 micra The present species is then approximately 22 times the diameter of the individual or 10 times that of the colony.

The body is spherical and measures 1.486mm. in diameter; it is enclosed in a mucilaginous envelope .540mm. thick. Beyond this again the stiff pseudopodia extend 1.892mm. so that the total diameter of the whole organism is 3.918mm. The pseudopodia are quite numerous, regularly arranged and project to an equal distance on all sides. They appear quite stiff and were not seen in active movement. The mucous envelope was only slightly granular and contained a few tiny spherical algae and still fewer somewhat spindle-shaped ones. On the outside of it were sparsely scattered tiny curved spicules apparently siliceous and somewhat pointed at each end. The envelope ran up a short distance on each pseudopodium.

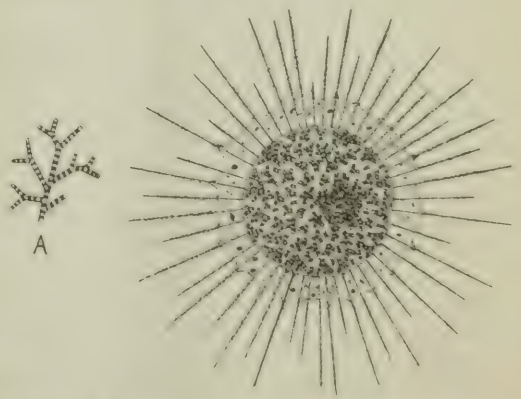


Fig. 1.—RAPHIDIOPHRYS MAGNA, general view. The darker area situated slightly excentrically represents the nucleus and endoplasm. A.—A small portion of the symbiotic Algae to show their characteristic dendritic arrangement.

(1) The British Freshwater Rhizopoda and Heliozoa, by J. Cash, G. H. Wailes and J. Hopkinson, Vol. V, Heliozoa, by G. H. Wailes, London, Ray Society, 1921.

The ectoplasm of the animal was quite granular as far as was observed, had no contractile vacuole, and contained a large number of green cells. The zoochlorellae, however, were not scattered about indiscriminately, but were arranged in a very characteristic dendritic manner and so filled the ectoplasm that the internal details could not be made out. The basal stalk of each group started right deep down and branched frequently as it passed outwards, thus producing a tree-like effect with the short branches on the periphery. All the threads were of equal diameter and appeared to be composed of a series of units placed end to end, each one containing a large green chloroplast in the middle and having almost transparent ends. The result was that the thread had a banded appearance.

The nucleus and presumably the endoplasm was eccentrically situated and could only be seen by transmitted light.

The animal was kept under observation for more than six weeks in the hope that it would divide, but unfortunately during an absence on a collecting trip in the hot weather it apparently died, for it disappeared and nothing like it has been seen since in the small glass aquarium in which it was kept.

Using the classification by Wailes it belongs to the sub-order Chalarothoraca, i.e., Heliozoa having an external envelope composed of solid elements with or without a matrix of plasma. It also fits in most closely with his definition of the Genus *Raphidiophrys*, i.e., body enclosed in a mucilaginous envelope containing spicules (spindle, awl or disc-shaped), which normally extend outwards along the pseudopodia; nucleus and endoplasm placed eccentrically.

Provisionally, pending an opportunity for more detailed study, it is proposed to place it in this genus with the name *Raphidiophrys magna* to indicate its large size.

GLEANINGS FROM THE CANADIAN WEST.
PART II. MAMMALIAN FAUNA OF ISLAY, ALBERTA.

By J. DEWEY SOPER.

What seems to me an interesting and essential consideration in respect to an animal study (aside of course from taxonomical and anatomical aspects), is the proper conception or imagery of its surroundings. So often the animal and its environment are surprisingly linked, again clearly dual, or as in some instances like Blarina and Peromyscus, of remarkable adaptability. In short, if we would really know the animal we need the knowledge of its habitat and abode. To assist in this, I have considered it proper to delineate in a few words the floral circumstances of the region around Islay.

It permits of three settings, the wooded; semi-wooded; and the prairie. The first is the usual poplar forest of the west, occurring in unbroken continuity only in the river valleys and their vicinity. This refers solely to the region of which I write, for in some places this is not the case. In the Vermilion and Saskatchewan valleys vigorous specimens of the balsam poplar (*P. balsamifera*) also occur, and in places the white spruce (*P. canadensis*) as well. The second is the park-like country which lies for the most part quite distinct and separated from the water courses, alternating its various-sized aspen (*P. tremuloides*) woods with prairie-land. This is very picturesque ground and particularly beautiful in autumn. In contiguity to lakes, it becomes practically an epitome of the last. The last, the prairie, seems self-explainable, but wide differences obtain even here from place to place. The Islay prairie, in the first place, is not entirely bald like that of some localities; neither is it on a dead level, both of which conditions add nothing to its attractiveness in my opinion. The surface describes an easy undulation, composed of greater and lesser swells and occasional engaging elevations such as the Twin Hills to the west and the Blackfoot Range, so called, to the south. Everywhere in this panorama are liberally dotted aspen bluffs of manifold shapes and sizes; clumps of wolf-willow scattered in between; and in every considerable depression, rings of red-willow that sur-

round grassy lagoons that were one-time sloughs. The first and last growths keep to high and low land respectively, while the wolf-willow seems to favor slopes and steep places, never in soaked depressions, but withal ranging indifferently. As a whole, the Islay prairies assume most interest, both from botanical and biological viewpoints, in proportion to their departure from monotonous nudity.

In addition to the country surrounding Islay, wherein the major number of my zoological excursions were confined, that is, in a four mile limit bounded by the Twin Hills to the west and Island Lake to the south, I had several opportunities of visiting remoter ground, the most interesting of which was to Laurier Lake on September 1, on which I wish to remark. It seems best, by way of presenting the facts in its connection, to couch it in narrative rather than in disjointed and purely technical form, in which latter much that gives tone to, and conception of, a visited region is necessarily lost. As this locality has never previously been investigated by any naturalist so far as I know, it seems more imperative to do a measure of justice to it at once.

Laurier Lake lies forty miles to the north of Islay, our proposed destination for the trip. The Vermilion and Saskatchewan Rivers must be crossed at a distance of five and thirty miles respectively. The car, our means of conveyance, was duly equipped the previous night for the outing, and all made ready for what we all anticipated as a great day's sport; nor were we disappointed in the smallest part. I should perhaps mention that the first was the opening day of the shooting season. The morning dawned in the most dispiriting manner, rain seemed imminent, but to experience the proper thrill with the day, and new country ahead, it seemed imperative to start with the dawn. Our judgment proved excellent, for by midforenoon the whole country was radiant with the matchless splendor of an Alberta morning. Never could skies be bluer or air so rare. As we spun along, occasional sharp-tailed grouse sprang wildly from the grassy trail with a staccato *cuc, cuc, cuc, cuc, cuc*, punctuating as they went their soaring and flapping flight. Nothing surely is more typically western and buoyant than these big handsome birds. Just before descending into the Vermilion valley we had a glimpse of a Franklin's ground squirrel as it scampered into an aspen bluff beside the trail, the only one of the species I saw in the west. As the forenoon advanced the birds got warmed into action, and hourly before dinner were more in evidence. The near-by shrubbery trembled and flashed occasionally with passing warblers, and sparrows languidly twittered half-hearted snatches of song, fall-like and disconsolate. And that season, the fall of the leaf had seemed actually to have arrived, for the first few mourners were even now rocking slowly to earth. The very air had a hue or quality of autumnal vigor and adventure. Flickers watchfully explored the patches of prairie; robins in social flocks drove swiftly by with a *cheep, cheep*. Swainson's stately hawk cleaved the sky in level circles; and the delectable mountain bluebird, so tender and so elegant, chanced often to cross our path.

About ten a.m. we neared a series of shallow and grassy sloughs dotted with a few shoveller and ruddy ducks, and of more than passing interest in the wheeling and settling flocks of sandpipers that sought its plashy margins. Three species were plainly present, which after some studied "collecting" proved to be the lesser yellow, pectoral, and Baird's sandpipers. The latter was one of those choice finds, counted so to me, which comes new and unexpected. Until sending it to Ottawa I had mistaken it for the Least sandpiper, which it closely resembles.

We were now in the vicinity of the Ridge, a moraine-like elevation stretching for miles on either hand, and locally of interest because of the Indian graves which are said to dot its sides. According to rumor, the warrior dead were buried there after a retreat from the bloody massacre, during the rebellion, which occurred near the mouth of the Saskatchewan. As this location is some twenty miles from the Ridge, the wounded evidently needed some help, especially the ones who forever will remain on the Ridge. I had no time to verify the existence of the graves, but I believe without doubt, remembering the source of my information, that they are there. The whole country should be interesting, anthropologically, for it seems

a vast burying ground for that departing race; here and there about the country relics are frequently found, and in two instances in fact, I have knowledge of their discovery. Both specimens I have in my possession. The one is a stone-hammer, three pounds in weight and in perfect condition (with the exception of a single chip out of one side), which I found near the Twin Hills. The other is a round stone ball, three inches in diameter and one pound in weight, picked up in a locality a few miles south of Islay where many others similar in weight and identical in appearance have been formerly found.

The panorama from the crest of the Ridge is a memorable one. The majestic prairies, alternating with aspen woods and terminating in the distant blue hills of the Saskatchewan, seem so peaceful and primeval that only a rugged column of buffalo is required to complete the circumference of one's reflection. Nearing the Saskatchewan, the woods become denser and more continuous, until, entering the valley system itself, the balsam poplars thrive in vigorous groves; the aspens crowd thicker and thicker and attain to greater height, and a few birch silhouetted here and there foreshadow the genuine borean forests. A peculiarity of these woods, and doubtless remarked by anyone passing them, is the exhalation of a mildly pungent and sour aroma that characterizes them, particularly during the fall, with the decadence of the leaves, and especially towards sun-down. It is neither fragrant nor wholly disagreeable, but remarkable for an illusive quality that inspires a really unmistakable tingle of adventure. It is but one of the many odors of the autumn woods, that make of a trip there a thing of rare enjoyment.

Ferrying across the muddy Saskatchewan with its surrounding wilderness of forested hills was not the least of the day's attractions; nor was the ascent by the winding wooded trail beyond. A proper panoramic view of this valley long lingers in the recollection. On a jutting sand-bar at the bend of the river, deer trails were in evidence; and the bar was said by the government ferryman here to be a regular resort to which they came from the woods to drink. Although it was merely fortuitous, we noted no ruffed grouse until north of the river, but now they frequently rose at our approach and bulleted through the woods. More often, however, as is their usual custom in the west, they merely walked slowly and pertly from view, whimsically clucking and spreading ruff and tail.

All along the route the prairie rose still bloomed, and occasional sequestered hollows were blue with violets even at this advanced date. Four species of fungi were noted all along the way, being, or most resembling, *Psathyrella disseminata; Lepiota naucinoides; Caluatia c aniformis;* and *Caluatia gigantica.* It is of further interest to note that neither the common raspberry nor hazel bush was observed until north of the river, becoming then of common occurrence.

The lakes are a particularly interesting locality. The conditions are so diversified that doubtless an equally divergent series of small mammals could be taken there consistent with it. My stay, unhappily, was of short duration, or much of the wistful speculation which I secretly bore to the woods would have become an instructive reality. In theory one has all the small mammals possible to the region, each in its own peculiar situation, from *Evotomys gapperi* in the mossy spruce swamps, to *Peromyscus borealis* on the aspen ridges, besides all the intermediates. The jumping deer are residents here, for numerous trails belonging to them were observed on the sandy beach at Laurier Lake. The latter is a fine body of water of considerable size, and yields several species of fish, some of which attain to very respectable dimensions. Whitney Lake, its sister, about a mile distant, is neither so large nor becoming, but its tortuous shore-line, with numerous secluded bays hemmed in darkly by the woods, creates a resort among the waterfowl that is quite unknown to the other. The day we were there, a single duck, a horned grebe, and two herring gulls, so far as I remember, were the only fowl we saw on Laurier, while on Whitney some coves were fairly black with them. Both lakes are surrounded by heavy coniferous woods, consisting of white spruce (*Picea canadensis*), tamarack, (*Larix caricena*), paper birch (*Betula alba*), balsam poplar (*Populus balsamifera*), and the trembling

aspen (*Populus tremuloides*). The conifers range back only a comparatively short distance from the lakes, forming an encircling collar about them, then being replaced entirely by the usual growth of aspen. The soil in places is very sandy, notably a streak between and to one side of the lakes, on which subsist small examples of jack pine (*Pinus banksiana*), developing further along into quite extensive groves. The general effect of the landscape reminds one of the stunted forests in the region of Lake Superior, particularly in the Hudsonian zone. The analogy is further heightened by deep spongy ground-moss that covers the low areas in places near the lakes, the logs and trunks covered with dull lichens, and the "old man's beard" that waves from the sepulchral spruces.

Richardson Ground Squirrel.

Citellus richardsonii (*Sabine*).

The Richardson ground squirrel by far exceeds in number any other mammal of the region, with one exception, and that doubtful — *microtus drummondii*. Colonies are nowhere extensive, due no doubt to the proximity of its northern limit (none were observed north of the Saskatchewan river); but individuals are scattered everywhere in hundreds. The most flourishing colonies are invariably found on high rolling lands usually on the slopes, and preferably in gravelly clay, but burrows are evident in all but the wettest locations. In places the comparative smoothness of the prairie is broken by innumerable dark earth heaps, throaty burrow entrances, and sunken runs. These last are used regularly as highways from one community to another, and as a rule are traceable by the eye from a distance, especially if viewed from a slight elevation. Like life, as a maze of endless continuity with its thousand currents crossing and counter-crossing and crossing again, these little prairie trails lead hither and thither, a perfect labyrinth, to both puzzle and entertain. In long grass or grain this system becomes, of course, much less evident, if not entirely hidden.

My first day at Islay, August 27, was principally taken up with this animal, both because of its abundance and the immediate access to its study. If approached slowly, ground squirrels or gophers remain head and shoulders exposed until your nearness sends them earthward at a vital moment with a flick of the tail and a husky whistle. A few are content to court human company at short range, feeding meanwhile within easy access of their burrows, but others again disappear at the first alarm. When sitting erect or crouched at burrow-mouth, somewhat timorous or moved by mildly-excited curiosity, a striking characteristic is the upward flick of the tail in time to a husky chirp. From this it has doubtless derived the local appellation of flicker-tail. An interesting experience when a whole colony has been frightened underground is to lie motionless on the prairie, and watch them reappear one by one and resume their several inclinations, which they readily do in a few minutes. Apparently already forgetful of their recent alarm, they exchange in low drowsy calls their expression of content in the mellow sunshine of the morning.

During September, in certain localities, hundreds of small drillings in the soil indicate the ground squirrels' activity in garnering a species of grass root or bulb. They also collect, so I was informed, the red berry of the wild rose and a low shrub blueberry resembling the huckleberry which grows sparsely on the prairie. In addition to these, they take a heavy annual toll from the grain-fields.

At Islay the gophers' nearest mammal neighbors are the two species of vole, the long-tailed weasel, and the badger. Habitually the two last prey upon the three first. On numerous occasions I have seen groups of badger borings in ground squirrel colonies with the evident purpose of feasting on those animals, but it is usually hard to tell with what success the badger meets. Some holes are shallow, while others are several feet in depth; the former I presume are merely prospect shafts. As the badger digs anywhere in the wildest abandon, without reserve, art or discrimination, it is often difficult and even impossible to decide which are dens and which prospects. Even after the snowfall of Oct. 8, these prospect shafts continued for a time as numerous and fresh as ever,

and were particularly conspicuous against the white of the landscape.

After the snow I followed weasel trails frequently and found that they freely went in and out of all gopher dens that lay conveniently to their course. As a diet the gopher is evidently highly regarded by this animal, but I found it impossible to ascertain when they explored with success. It was incredible that there could have been a gopher in each of the burrows visited, for in the course of a night's run they seemed almost innumerable. I never had the patience to follow to the end in all its intricacies the night's trail of an ermine, although my wanderings in this regard have been really extensive as a whole, and not without a like measure of enlightenment and pleasure.

An old plainsman told me that once from his horse, he watched a prairie weasel enter a Richardson's ground squirrel colony when the majority of the members were under ground. He bounded easily but furtively about from mound to hollow and through herbage, lithe as a reptile, and nosing the ground occasionally like a hound. Presently there caught his eye an isolated and unlucky gopher liberally separated from his burrow. The latter was feeding with his back towards the weasel, but at this moment, apprehending danger by some subtlety, he clumsily wheeled and made a few frightened jumps towards his home. The weasel met him with the thirst of conquest, severing all hope of escape. In a flash the gopher, realizing this, sank back threateningly, chattering and screeching hoarsely with terror; the next breath and the two were mixed in combat. But, strange to relate, attracted by the confusion of wails and weird vocal pirouettings from the expiring gopher, relatives and neighbors shot out everywhere from their burrows, and poured in one averting or avenging mob about the ears of the aggressor. Left alone with one gopher the weasel is undoubtedly happy, but this chippering, champing, insane rabble was too much. He breasted the tide gallantly for a while, lost heart, and remembered a pressing engagement in another quarter; or were the grapes sour anyway? A few gophers followed him for a short distance by way of impressing further the ignominy of defeat, then returned with declining ardor to disperse gradually to their separate dens. My informant remarked that the whole was so quickly enacted that he sat in the saddle half bewildered, scarcely able to comprehend the fleeting bit of wild drama that had passed before his eyes. Even the outraged gopher, he said, had so far recovered, that when he rode down into the colony it too limped its way along and disappeared, leaving the prairie still and deserted.

In regard to the hibernation of this gopher I was agreeably surprised. I had received the impression in some manner that, like the woodchucks of the east, they disappeared in mid-September; instead, however, they braved the rigors of October and even that of November. After the snowfall of October 7 they dug upwards through the snow as numerous as ever, but the succeeding cold and snow put the majority under by the middle of the month. On October 29, near a wolf-willow clump on the prairie, I noticed where an ambitious individual had tunnelled along under a few inches of snow for over twenty feet. This subterranean work was carried at intervals so near the surface that detached portions caved in, exposing the run below. In other instances, by the dirt mixed with the snow, the passage seemed driven directly in contact with the earth. For several days in early November, though the mercury was much below zero, an unusually hardy animal, reluctant to assume the long sleep, daily scampered to and fro between den holes in the snow separated by several yards.

FRANKLIN GROUND SQUIRREL.

Citellus franklinii (Sabine).

The northern range-limit of this brush-land cousin of Richardson's gopher, must almost coincide with that of the latter animal, from all information I could get; but in point of abundance there is no comparison between the two. Richardson's squirrel is almost everywhere south of the Saskatchewan, while Franklin's seems highly restricted in its range, and at Islay is nearly absent. I sighted one as it ran into a bluff near the Vermilion river on September 1, but never saw another, although five days later on a beautiful afternoon I hunted this and other promising localities along the valley until nearly night. Search for them in other localities was likewise fruitless. Information from

several sources indicated that it was more likely to occur on the brushy west slopes of Pleasant Valley than anywhere else, a locality I was unable to visit. I had also reports of its occurrence in the region of Raft Lake, where it visits the portable graineries drawn up near the woods.

STRIPED GOPHER.

Citellus tridecemlineatus tridecemlineatus (Mitchell).

Rare at Islay. It seems strange that the single individual responsible for this entry should have made its home under the very foot-path of the village. But there it was, well satisfied apparently with the resounding tread of feet above its head. Old inhabitants recognized it as an animal occurring at various points throughout the region.

LITTLE CHIPMUNK.

Eutamias quadrivittatus borealis (Allen).

Mr. Sydney Blair of Dewberry, a keen and interested observer, states that the little chipmunk ranges in the dry aspen woods surrounding Raft Lake, often making excursions to the fringes of the grain fields which here meet the woods. I expected to find it in the Vermilion valley, but, as in the case of the Franklin's ground squirrel, my most ardent exploration failed to discover it. After an acquaintance with it at Edmonton I felt particularly desirous of seeing it again, but that pleasure was denied.

HUDSON BAY FLYING SQUIRREL.

Sciuropterus sabrinus sabrinus (Shaw).

Reported as occurring in the mixed and denser portions of the spruce and poplar woods at Raft Lake. Doubtless, may be found also along the Saskatchewan and perhaps Vermilion rivers, as frequently I secured them under like conditions at Edmonton.

HUDSON BAY RED SQUIRREL.

Collected on September 1st a single specimen (male) in the spruce woods off the east shore of Whitney Lake. The summer pelage shows no sign of shedding. The underparts are distinctly more creamy-buff than any of my earliest October specimens taken at Ridout, northern Ontario, 1918. This specimen measures: Length, 310; Tail, 115; Foot, 48.5. Bulky nests of shredded bark etc., belonging to this animal, were fairly common in the conifers at Whitney. The only sign I saw of it at Laurier Lake was a fragment of mushroom wedged in the branches of a large spruce.

PRAIRIE HARE.

Lepus campestris campestris (Bachman).

Formerly unknown, but gradually migrating northwards. During my stay one was flushed on a grain field a bare mile south-west of the village, which was affirmed by all with whom I talked concerning it as the first known event of the prairie hare in the vicinity. It had never previously been seen nearer than sixteen miles to the south, and that only a single individual three years before. The northward fringe of its range seemed indefinitely fixed away to the south, of late years pushed polewards by a few adventures on a line with Wainright, until this fall a crusader appeared far beyond the natural range, perhaps the advance-guard of a general future movement. The clearance of the land is undoubtedly the incentive, much like the invasion of southern Ontario by the prairie mouse (*P. m. bairdii*) of late years.

SNOWSHOE RABBIT.

Lepus americanus americanus (Erxleben.)

Scarce this fall, but in the recurring cycle of its septennial abundance scouring the country in thousands. Sometimes, according to an informant, entire aspen bluffs are 'barked' until they die. After the snow fall of October 7, their widely scattered trails were occasionally seen.

CANADA WOODCHUCK.

Marmota monax canadensis (Erxleben).

Occurs only very sparingly at Islay, and perhaps so over the entire west. Any individuals which I have seen were noticeably smaller than the familiar woodchuck of the east. A specimen taken at Edmonton in September 1912 was only about two-thirds the size, reddish and grizzled however similar to the latter. This may have been an adolescent.

BADGER.

Taxidea taxus taxus (Schreber).

Very common: badger holes were in evidence at intervals nearly everywhere. Most of these were doubtless prospect shafts in search of gophers. Sometimes in colonies of the latter a half dozen may be sunk

in a single night in addition to much travelling and digging in other places. They are powerful and effective excavators and what may be assumed as the work of several may be the work of one. I shot one near the Vermilion in early September. Dusk was just creeping over the prairie, when passing near a cut bank we caught a glimpse of something moving about, and approaching saw one of these animals slouch into a hole it had freshly dug there. It soon reappeared, sniffing curiously, with its nose high in the air, then suddenly disappeared again. After a wait of five minutes it boldly repeated its tactics in an attempt to solve the mystery of its visitors.

CANADA LYNX.

Lynx canadensis canadensis (Kerr).

Formerly common in the wooded Vermilion basin, and apparently a few still breeding there, but now nearly trapped to extinction. Last year an adult and two young were killed three miles north of Islay.

PORCUPINE.

Erethizon dorsatum dorsatum (Linnaeus).

At Islay the porcupine is encountered only at very rare intervals. The nearest woods of any particular density lie along the Vermilion river four miles to the north. While driving in this basin on July first two years ago, my brother-in-law Mr. William East of Islay came upon one loitering near the trail. This is the only one he had seen there after many years residence.

MUSKRAT.

Ondatra zibethica spatulata (Osgood).

Perhaps a great factor in the general depletion of this animal of late years has been the gradual subsidence of scores of sloughs and small lakes throughout the region, until now great numbers are either totally dry or nearing that condition. An area of hundreds of acres west of town, once a lake ten feet in depth and the home of hundreds of rats, is now as dry as the rest of the open range, fed over by stock and yielding alike good crops of natural hay and Drummond's vole. A tract opposite the station which a few years ago provided excellent duck shooting, is now entirely dry. Scores of like incidents could be cited. The lakes remaining are of course gradually sinking, and, as at Island Lake, one time islands are slowly rising to the dignity of peninsulas when lying off shore. Richardson's ground squirrel has already established himself on these with alacrity. It is estimated that between one and two thousand muskrats inhabited the dried-up lake west of Islay in pre-settlement days. This has an area of approximately one and a half square miles. Two trappers, operating between Edmonton and Vermilion via the Vermilion lakes in 1908, took for fall and spring 3,900 muskrat skins. From Manville to Vermilion, on the Vermilion river, a distance of about fifty miles, one party in the old days took 2,500 skins, and I understand this was for the fall only. Today the majority of these places are nearly destitute.

PRAIRIE SKUNK.

Mephitis hudsonica (Richardson).

This species is not at all common but is generally known throughout the country.

MINK.

Mustela vison vison (Schreber).

Very rare. Only one mink trail observed in thirteen years by an old resident pioneer. This was on a mud bar of the Vermilion.

CANADIAN BEAVER.

Castor canadensis canadensis (Kuhl).

Almost exterminated. One family of bank beaver known to exist still near the confluence of the Vermilion and Saskatchewan rivers.

PRAIRIE WOLF OR COYOTE.

Canis latrans (Say).

Much more plentiful formerly, but still common. On November 23 five locally caught skins were sold in the village. Numerous animals were sighted during the fall. Some time in October, after the snow, one intrepid individual raced ahead of our car down the trail, leaving it only as we approached to within about twenty-five yards, then side-stepping just sufficient to get screen behind some low willows that lined the ditch. As we dashed by he stood there partly visible, wearing a languid quizzical grin that was comical in the extreme. After the snow fall of October 7, 8, to sight their trails was a daily occurrence.

LONG-TAILED WEASEL.
Mustela longicauda longicauda (Bonaparte).

A very common species on the prairie, but their presence, unless by one purposely seeking them, would pass unsuspected. A specimen taken on October 18 was still brown dorsally, but shedding rapidly, with a thick fine coat of white replacing it beneath. About November 3 half of the specimens collected had a scattered but diminishing quantity of brown, while all those after the sixth were pure white. A wide-spread individual variation prevails in completing the moult, although each and all, it will be noted, exist under the same local conditions. Occasional weasels had completed the moult before November 1, while others in a like environment a week later still presented a thin brown shade their entire dorsal length.

Following are the measurements of *longicauda* taken in the vicinity of Islay.

Sex	Length	Tail Vert.	H. Foot
Male	430	140	50
Male	450	155	50
Male	445	155	50
Male	475	175	50
Female	390	140	45
Female	365	125	40
Female	370	130	42
Female	400	145	45
Female	375	125	47
Female	380	130	46

Throughout periods of intense cold and even winter storms the long-tailed weasel seems to pursue activities without abatement. Many animals, though remaining active throughout the winter, are clearly more so during the lulls of fine weather. Often have I observed the suspended activity of such as red squirrel and mink during and succeeding violent winter storms. But the long-tail pays little heed to these. On November 5, although snow fell for the entire day before and part of the succeeding night, the ermine was found to have been around and about his business as usual. They doubtless travel on the coldest and stormiest nights of winter, and, in the case of the long-tailed species, over the bleakest and most exposed ranges.

Their chosen field is the open prairie where they wander erratically from place to place, visiting wolf-willow clumps, gopher holes, odd stones, aspen bluffs, and any other irregularities which appear in their line of travel. Their life seems an endless roving in search of food, conducted without design, lacking home and apparent destination. This may be regarded as a superficial impression. Having spent many hours upon their trails in the snow and cold, unravelling as it seemed a clue to their very lives and destiny, I have discovered the opposite to be the truth. Although their wanderings seem the most erratic and inconsistent imaginable, there is yet beneath it a species of method. I have never been able to connect positively their widely scattered trails with a fixed abode, but I have learned that they habitually return again and again over the same route. The male in particular is perhaps always detached, leading an irregular and nomadic existence. While this may be true, it is seen that a relatively fixed locality is adhered to for their hunting, and is withal, considering their size, of very considerable extent.

DRUMMOND VOLE.
Microtus drummondii (Audubon and Bachman).

Despite the drouth of last summer, which doubtless had a negative effect on the procreation of such moisture-loving animals as this species, it still remains, with one exception, the most abundant mammal of the region. It is found only in damp situations or the nearest to this condition. Ranchers making hay in September on the dry lake bottom west of the village reported considerable numbers of this vole, and I found their runways in the arching grass of nearly all low moist places over the prairie. Their most fruitful habitations are those cup-like depressions among the hills which were once brimming sloughs but now no moister than the average lowland pasture. They look odd now, with the precise elliptical willow borders surrounding those hollow and grassy lagoons. The vegetation in these places is quite luxuriant, opulent with the fragrance of pennyroyal, and mystically entangled enough for any rodent recluse. The ground, covered with herbage, is broken into myriads of little hummocks, among which the eccentric trails wind and criss-cross about, some expunged in the near distance and others winding in baffling intricacy to finally disappear in miniature caverns in the turf. The trails

are neither so numerous nor well defined, however, as those I have seen in the east and north, where oftentimes the natural meadows were perfect labyrinths of interlacing trails, and vegetation and muck were irreparably united in highways of unusual foulness.

Measurements of *drummondii* collected at Islay, Alberta.

Sex	Length	Tail	H. Foot
Adult. Female	150	35	18
Adult. Male	140	35	17
Adol.. Male..	127	30	16
Juv.. Male..	112	27	17
Juv.. Male..	95	20	16

LEAST UPLAND VOLE.

Microtus minor (Merriam).

To me the discovery of this mouse was of more than ordinary pleasure; not merely because of its comparative rarity or its newness to me, but also because of the conditions it represented. It is not confined to dank bottomlands like *drummondii* but climbs to the racy pastures far above. It loves the prairie crests and its spicy winds, the flowing undulations of fragrant herbage, and the rustle of the wolf-willow. In the very expression 'upland' one feels a subtle suggestiveness that floats the mind instinctively to the lonely north, the north with its glamour of brooding plateaus, its silent and immutable tundras.

At Islay the upland vole casually occupies the lusher lowlands, not much in elevation above *drummondii*, but always, so far as I could learn, on ground never subject to inundation, which is distinct from that of the latter. The local habitat of the two, if not actually overlapping, certainly is subject to a very fine delimitation. In the matted grass of willow-grown but elevated flats it is as likely to be found as anywhere, although its presence is by no means as certain as the other species. When finally located its sparse trails will be found leading languidly among the willows, rose bushes, and herbage; tunneled through the latter rather than over; fashioned round without a break for considerable distances. On the slopes or in creases of the prairie it lurks in grassy tangles beneath wolf-willow and aspen, and at times, as previously mentioned, turns to the very crest of ridges that are gilded with the first and last lights of dawn and sunset.

Unlike the vexing separation of many members of this genus, the present voles are palpably distinct; with the two side by side, colour difference alone suffices to separate them. *Drummondii*, heavy set, and of a reddish-grey colour, contrasts clearly with the slighter build and silvery-grey of *minor*. For a time, while trapping, the occurrence of these two colorations, which I distinguished from the first, proved rather puzzling. Having no literature along led me erroneously to imagine it a seasonal phase on the same species. In trapping, however, I noticed that each 'phase' singularly appeared separate, which led me very early to suspect the truth, as is shown in this journal entry: September 26 — "A second specimen tonight of the grey *microtus*, both from the same trap. It would appear that this animal is perhaps a distinct variety from the reddish-grey vole. At any rate a cursory examination of the few *microtus* taken here suggests this;" and again for September 27, I find in part this note: "Succeeded in capturing another silvery-grey vole. Reference was made to this animal on both the 24th and 26th. This one of to-day as well as the others were all taken in the same trap and locality and only at a slight elevation and distance from the lower ground where I succeed in collecting only the brownish voles."

Islay is close to the northern limit of its range.

Measurements of Islay specimens of *microtus minor*:

Sex	Length	Tail	Foot
Male	110	18	14
Male	115	17	15
Female	115	23	14
Female	108	17	15
Female	116	22	15

BAIRD'S MASKED SHREW.

Sorex personatus haydeni (Baird).

Only two of this diminutive and rather obscure animal were collected at Islay. Both were taken in the same trap and in the same damp lowland where most of my drummond voles were captured. They appear to be rather uncommon. A plainsman told me that in passing low places at night he had frequently seen these shrews darting across the trail under the glare of the head-light on his car. The two specimens secured are noticeably smaller than

any of this species I have previously taken elsewhere. It was first thought that they would prove to be *Microsorex hoyi*, but a dental and cranial examination rendered them referable to the above *personatus* subspecies. Dr. R. M. Anderson of Ottawa kindly identified these for me, as he did also all the other small mammals secured on the trip. The Islay specimens of *haydeni* measure: Length, 85-82; Tail, 24-22; Foot, 10.5-11 mm.

In addition, I have the following statement from Mr. Henderson, Acting Chief of Bureau, U. S. Biological Survey:— "Your specimens have recently been critically examined by Dr. Jackson, and he considers that they are referable to *Sorex personatus haydeni* as you suspected, although, as above intimated, your specimens are from a point considerably west of the previously known range of this form. He reports that they approach *S. personatus* in relative narrowness of the rostra and in color."

NORTHERN WHITE-FOOTED MOUSE.

Peromyscus maniculatus borealis (Mearns).

At Islay the deer mouse is either very uncommon or exceedingly seclusive; I favor the former view-point. In all my rambles and exploring only a single specimen was either seen or taken, and that only by merest accident. Usually a collector secures his specimens by clear design and is rewarded in direct proportion as he may assiduously practise it, but my specimen came without that. I was walking near the Twin Hills on September 11 and close to some old homestead buildings when, chancing to cross a portion of old board on the ground which I kicked in passing, an adult white-foot leaped away and danced about looking for escape, but that was rather reluctantly denied him. Without this contingency I should have been entirely unaware of the presence of this species. It shows a very pronounced darkish-brown dorsal band; buffy cheeks; white pencilling on the ear rim, and pallid plumbeous-grey underparts. Measurements: Length, 140; Tail, 40; Foot, 18, (Male).

JUMPING MOUSE.

Zapus hudsonicus.

Not common. A single individual observed on the north-western outskirts of the village. As so often occurs, it made its escape; at times it requires about three men and a dog under the most favorable circumstances to successully compete with a jumper for its life.

THE BIG GAME.

To a genuine nature-lover, one of the most ominous tendencies of the day at Islay is the gradual depletion of the big game. The game must go of course as a natural consequence of settlement, and where it is going, but not gone, it is still but a prophecy of the future. The graphic tales of early days to which one eagerly listens now, portraying their wild and romantic abundance, perhaps on the very spot you occupy, serves but to accentuate their present absence, their irrevocable and irreconcilable loss. The comparative speed with which they sometimes disappear is also a significant item. Previous to 1910 at Islay the moose and mule deer were tolerably common in all the wooded river basins, but now both are gone entirely from the vicinity and a bare ten years has passed. While the moose may still be found in pretty fair numbers a considerable distance to the north, the other is considered nearly extinct. The blacktail deer was formerly common, but is now very rare. Elk in the old days, according to information, came and went in sizable bands, but they are a stranger there now, and the nearest is a restricted company to the west of Primrose Lake a hundred miles to the north. The jumping deer has fared much better. As mentioned elsewhere, it is still found in the Saskatchewan valley, and all through the woods northward to the lakes already referred to. Occasional ones may yet survive in the remoter nooks along the Vermilion river, especially towards its confluence with the Saskatchewan. Where other big game either perish or retreat, the jumper frequently loiters with impunity. It loves to dabble about the skirts of civilization, and even increases with a little encouragement. At Edmonton, in 1912, I often saw them or their fresh beds within three miles of the city, and that with a population of seventy thousand people. Instead of retreating like the wary moose, they linger on, secretively gazing on the strides of industry, relishing the settlers' first succulent crops, and then at last, succumbing on the soil of their birth.

A CONTRIBUTION TO THE ALGAE FLORA OF THE OKANAGAN (BRITISH COLUMBIA).

By E. D. Sismey.

CLASS MYXOPHYCEAE.

Order I. Coccogoneae.

1. *Dactylococcopsis montana* W. & G. S. West, in lake plankton.
2. *Merismopodia elegans* Braun, in ditches, April.
3. *Aphanocapsa spec.* not determined.

Order II. Hormogoneae.

Family. Scytonemaceae.

4. *Scytonema myochros* (Dillwyn) Agardh, growing on rocks moistened by water at Peachland, May.

Family. Nostocaceae.

5. *Nostoc depressum*, Wood, Penticton Creek flume, May.
6. *N. microscopicum*, Carmicheal, from squeezings of a water moss resembling Sphagnum, June.
7. *Nodularia spumigena var. genuina*, Bornet & Flahault, in ponds Indian Reserve, May.
8. *N. Harveyana* (Thwaites) Thuret, in sloughs, Pen, May.
9. *Anabaena inequalis* (Kutz), Bornet & Flahault, small pond Indian Reserve, June.
10. *A. flosaquae*, Breh, free floating in sloughs.

Family. Oscillatoriaceae.

11. *Phormidium autumnale* (Ag) Gom, on wet rocks at Peachland, B. C., May.
12. *Oscillatoria limosa*, Ag, in small pond Dog Lake.
13. *O. formosa*, Bory, Penticton sloughs.
14. *O. geminata*, Menegh, outlet of a septic tank.
15. *O. agha dii*, Gom, in pond Dog Lake with *O. princeps*.
16. *O. princeps*, Vauch, free floating balls in small pond Dog Lake. This huge Alga is uncommon.
17. *O. boryana*, Bory, at the outlet of a septic tank.
18. *Spirulina major*, Kutz, Penticton Creek in ponds.
19. *S. meneghiniana*, Zenard, moss squeezings.

Family Rivulariaceae.

20. *Rivularia pisum*, Ag, in water moss, Dog Lake; also on weeds, Ok Lake.
21. *Calothrix parasitica* (Chauvin), Thuret, growing on a floating log, Dog Lake.

Peridinieae. — I have omitted this group from this list not only because I have no literature on the subject, but because some authorities group them among the Flagellates. Whatever view is taken the Peridinieae may be left out without spoiling the general balance of the list. They are naturally a subject for a special study. The Peridinieae are of considerable economic importance as they are large storers of reserve food material, thus forming a basic food supply for countless small organisms.

Bacillarieae. — The Diatoms are universally acknowledged to be a subject for a special study. As some 12,000 species (including fossils) have now been described it is difficult to attempt to enumerate species in a list of this kind. At the same time, as Diatoms usually form a considerable proportion of the plankton gatherings I include several genera with some specific identifications in my plankton notes of Okanagan Lake. In this respect the diatoms are of special interest in establishing periodicity curves, and also, *en passant*, a great many points of biological interest may be observed.

CLASS CHLOROPHYCEAE.

Division I. Isokontae.

Order I. Protococcales.

Family. Volvocaceae.

Sub-family. Chlamydomonadeae

22. *Chlamynomonas spec.* in slough plankton. Identification of species a matter of great difficulty, there being a difference of opinion among the best authorities. The Genus Chlamydomonas occupies a position of great interest among the green algae. It is looked upon as the starting point in

the evolution of green Algae and perhaps of all plant life.

Sub-family Phacoteae.

23. *Phacotas spec.* not determined. The same difficulties surround this genus as above.

Sub-family Volvoveae.

24. *Gonium pectorale,* Mull, in green scum in vast numbers at bottom of slough, May.

25. *Pandorina morum,* Mull, common in sloughs.

26. *Eudorina elegans,* Ehrenb., common in slough plankton.

27. *Volvox aureas* (L) Ehrenb. This alga was to be found in vast numbers in the slough plankton during the latter part of May.

Sub-order TETRASPORINEAE.

Family Palmellaceae.

Sub-family Tetrasporeae

28. *Tetraspora lubrica* (Roth) Ag, on stones at the outlet of a small spring, Summerland, May.

Family Protococcaceae.

29. *Trochiscia aspera* (Reinsch) Hansg., common in plankton.

Family Autosporaceae.

Sub-family Oocysteae

30. *Oocystis solitaria,* Wittr., slough and lake plankton.

31. *O. crassa,* Wittr., as above.

32. *Nephrocytium aghardianum,* Nag., from squeezings of a moss resembling sphagnum.

33. *Tetracoccus botryoides,* West. lake plankton, April.

Sub-family, Selenastreae.

34. *Scenedesmus bijugatus,* (Turp) Kutz., lake and slough plankton.

35. *S. quadricauda,* (Turp.) Breb, as above.

36. *Ankistrodesmus setigurus* (Schrod) West, slough plankton.

Order 2. SIPHONALES.

Family. Vaucheriaceae.

38. *V. geminata* (Vauch) DC. Dog Lake in ditches. Vaucheria grows in felty masses like moss and may be recognized from other algae with the naked eye.

Order 3. SIPHONOCLADIALES.

Family Cladophoraceae.

Sub-family Cladophoreae.

39. *Cladopho a c ispata,* Roth. Penticton Creek, Sept.

Sub-family Rhizoclonieae.

40. *Rhizoclonium hieroglyphicum,* (Roth) Kutz. sloughs, also Marron Lake.

Order 6. ULOTRICHALES.

Family Ulotrichaceae.

41. *Ulothrix zonata,* (Web & Mohr) Kutz., common, found in many stations at all seasons.

42. *U. subtilis,* Kutz., Okanagan Falls, Apr., growing on stones under water, where current was swiftest about 12-15 miles per hour.

Family Microsporaceae.

43. *Microspora tumidula,* Hazen, Dog Lake, entirely an American species.

44. *M. stagnorum,* (Kutz) Lagerh., common in pools more or less stagnant.

Family Chaetophoraceae.

Sub-family Chaetophoreae.

45. *Chaetophora pisiformis.* (Roth) Ag. growing on a floating board. Sloughs.

46. *C. elegans* (Roth) Ag. growing on a dead stick, sloughs.

46. *C. elegans* (Roth) Ag. growing on a zen, Dog Lake on a submerged log.

48. *Draparnaldia plumosa* (Vauch) Ag., free floating Ok Lake.

49. *Draparnaldia glomerata,* (Vauch) Ag., on dead tule (Scirpus spec.) Pen sloughs.

50. *Myxonema tenue* (Ag) Kutz., Ok Lake.

Sub-family Microthamnieae.

51. *Microthamnion Kutzingianum,* Nag., on dead tule (Scirpus spec.) sloughs.

Division II. AKONTAE.

Order 1. CONJUGATAE.

Family Zygnemaceae.

Sub-family Mesocarpeae.

52. *Mougeotia spec.* This genus is quite common, sterile filaments only.

Sub-family Zygnemeae.

53. *Zygnema ericetorum* (Kutz) Hansg., in drying pond by Okanagan River.

Sub-family Spirogyreae.

54. *Spirogyra tenuissima,* (Hass) Kutz., ponds Penticton Creek, May.

55. *S. inflata* (Vauch) Rabenh., as above.

56. *S. nitada* (Dill) Link., ditches Penticton, April.

The family *Zygnemaceae* is perhaps the most widely scattered and by far the most noticeable of all the algae.

That bright green hair-like growth so common in ditches and ponds is usually made up of one or more members of this family. Time will enlarge this group greatly in Okanagan. Specific identification is possible only when filaments are in a fruiting condition and zygospores present, an occurrence not of great frequency. As yet I have had no success with artificial cultures.

Family Desmidiaceae. This family is not represented in this list as the writer has no literature on the subject. The extreme difficulty in the study of Desmids and the comparative scarcity of good literature renders it a subject for separate study. The Desmids are none the less of extreme beauty and great interest, especially in the apparent connection between the richness of the Desmid flora and the older Geological formations. In future, however, I shall be in a position to assign the Desmids to their respective genera.

Division 3. STEPHANOKONTAE.

Order 1. OEDOGONIALES.

57. *Oedogonium* spec., sterile filaments only have been collected. Specific identification is impossible except when in a fruiting condition, and even then it is a matter of difficulty.

Division 4. HETEROKONTAE.

Order 1. HETEROCOCCALES.

Family Chlorosaccaceae.

58. *Stipitococcus urceolatus*, West, epiphytic on *Rhizoclonium hieroglyphicum*.

Family Botryococcaceae.

59. *Botryococcus Braunii*, Kutz., very common in plankton at all seasons.

Order 2. HETEROTRICHALES.

Family Tribonemaceae.

60. *Tribonema bombycinum* (Ag) Derb & Sol, common in ditches.

61. *T. bombycinum forma minor* (Wille) West, as above.

Order 3. HETEROSIPHONALES.

Family Botrydiaceae.

62. *Botrydium granulatum*, Ehrenb. (L) Grev., uncommon and very interesting; found on the drying up mud of a small lake, May. Growing on flumes (at the junction of the boards, where slow leakage occurs) to a size much larger than usually recorded.

CLASS PHAEOPHYOEAE.

Order SYNGENETICAE.

Family Chrysomonadinaceae.

63. *Synura uvella*, Ehrenb., slough plankton.

64. *Uroglena volvox*, Ehrenb., as above.

Family Dinobryaceae.

65. *Dinobryon cylindricum* Imhof., slough plankton.

The system of classification used in this list is that of Prof. G. S. West in his work on Algae, Vol. 1, Cambridge Botanical Handbooks, 1916. It is, I think, the most modern classification and in harmony with the latest biological experience.

The species enumerated in this list are all positive identifications and are for the most part the result of the independent observations of Mr. F. L. McKeever, F.R.M.S., and myself. A great many of the collections were made by us jointly, but the microscopical investigations were carried on separately in our own homes. Doubtful species and errors are therefore absolutely eliminated.

The list is as yet woefully incomplete, but I hope in the course of a few years to lengthen it to a great extent.

AN EXAMPLE OF GRAVITY DEFORMATION IN A LIMESTONE SLAB.

By E. M. KINDLE.

It is probably not generally known that cemeteries sometimes afford important data concerning the modification of certain physical characters of gravestones which may take place with the lapse of time. In the erection of monuments the conditions for highly instructive experiments have been sometimes unconsciously prepared. It is the purpose of these notes to record the results of one of these fortuitous experiments in which gravity has produced deformation.

Numerous examples occur in nature of the deformation of consolidated rocks produced by lateral pressure and gravity combined; but no recorded cases of deformation produced by gravity alone under natural conditions have come under the writer's notice. In the experiments of Daubree [1], Townsend [2], Adams [3], and others, the great changes in shape which can be produced in hard rocks and metals by pressure have been shown, but experiments in which gravity alone is the active factor in deformation have apparently been neglected because of the length of time required. Experiments aiming to produce rock deformation by the action of gravity alone appear to have been undertaken only in the case of ice. [4].

Examples may occasionally be found in cemeteries which give some definite information regarding the amount of flexing which may result through the action of gravity alone. Such cases are worthy of record because they afford data on a phase of rock deformation which can hardly be approached experimentally, because of the time required.

King [5], Ashley [6], and the writer [7], have described examples of permanent flexing in marble slabs which have been supported by the ends. Becker [8], has noted in old buildings such as the Alhambra "slabs of rock very much bent by end pressures acting for hundreds of years."

Previously recorded observations on deformation in cemetery monuments all refer, with one exception, so far as the writer is aware, to marble slabs. The exception, if it may be so termed, is described by Winslow [9] as a white crystalline limestone or marble.

It is purposed to call attention here to the case of a limestone slab covering a grave in a cemetery in Hull, P.Q. In the example under consideration the stone is an unaltered limestone of Trenton age as indicated by the fossils which it contains.

During the early history of the Ottawa Valley slabs of Trenton limestone were sometimes used for monuments in the local cemeteries. In the Hull cemetery there is a slab of Trenton limestone over one of the first graves made in this cemetery which is supported on two upright stones placed under the two ends, the middle portion of the slab being subject to gravitational pull without any support. This has developed in the middle portion of the slab a sag amounting to 1½ inches. The general appearance of this slab is shown in the accompanying photograph (Fig. 1). This slab has a length of 6 ft. 6 in., a width of 2 ft. 10½ in. and a thickness of 3¾ in. The inscription on the face of the stone indicates that it was placed in position in 1844 or a little later. The deformation which this slab of Trenton limestone has suffered has been developed therefore during a time interval of not more than 77 years.

(1) **Etudes Synthetiques de Geologie Experimentale**, 1879.

(2) **Jour. Franklin Inst.**, Mar. 1878.

(3) **Geol. Soc. of Am. Bull.**, Vol. 12, pp. 455-461.

(4) Von Engeln, O.D., Experimental Studies and Observations on Ice Structure, **Am. Jour. of Sci.**, 4th. ser., Vol. 40, pp. 459-460, fig. 7. R. S. Tarr and O. D. von Engeln, Experimental Studies of Ice with reference to Glacier Structure and Motion, pp. 82-139, fig. 9, **Zeitschrift fur Gletscherkunde.** Bd. 1x, 1915.

(5) **U. S. Geol. Exp., 40th. Par.**, Vol. I, p. 752.

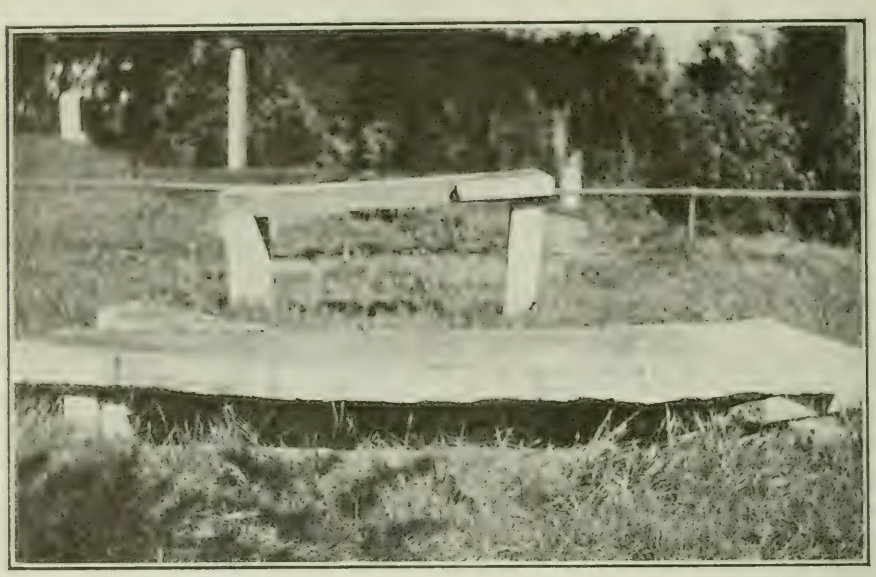
(6) **Proc. Cal. Acad. Sci.**, Vol. 3, 2nd. ser., 1890-92 (1893) pp. 319-324.

(7) **Proc. Ind. Acad. Sci.**, 1894, pp. 49-50.

(8) **Geol. Soc. of Am. Bull.**, Vol. IV, 1893, p. 53.

(9) **Am. Jour. Sci.**, Vol. 43, 1892, pp. 133-134.

This slab, with its curved surface, may be considered to represent an arc of a circle which, if completed, would have a diameter of 85 feet. In other words, a slab of Trenton limestone 3¾ inches thick and 266 feet in length could in a period of 75 years or less be bent into a circle if subjected to a stress no greater than its own weight.



THE TREATMENT OF SKIN IRRITATIONS DUE TO POISON IVY.

The excessive heat of last summer, causing profuse activities of the pores of the skin, was to a measure responsible for the large number of cutaneous inflammations produced by poison ivy. Persons who had never before experienced the effects of poison ivy succumbed to attacks this year, and the usual feeling of security by persons considering themselves "immune" was largely lost. Observations for a period of years lead me to believe that no person is permanently immune, unless he succeeds in avoiding contact altogether. On the contrary, people who heretofore were never bothered by the effects of this plant, and who claimed to be quite immune, became violently affected when in a state of profuse transpiration.

The name poison ivy is well known — and scores of harmless plants are carefully avoided by the camper or picnicker. It is remarkable how few people do actually know and recognize the plant. All have some idea, mainly the wrong one, until they experience the effect on their own skin of having come into actual contact. Where there is rocky ground or pure sand beaches bordering woods, where pines and ash grow, there is it necessary to survey the ground for this bane of outdoor life. Remember the three leaves of poison ivy, which distinguish it readily from the five-leaved Virginia creeper which it resembles. In fall the leaves turn golden brown to bright red and are not infrequently gathered for their glory by the unsuspecting. Beware! Beyond the beauty lurks the beast, and skin inflammations are sure to follow indiscretion. One would expect that people would be familiar with the appearance of such irritation, but only those actually affected remember the symptoms; indeed, often enough poison ivy rash is not recognized by the learned professions. Invariably children are the victims. Picking berries, roaming among the brambles, their naked feet covered with harmless minute scratches; their energy excites their spores to increased activity — and from a few hours to a few days after, there appear the

first symptoms of poison ivy injury, at first merely a redness, irritable and itching, slightly raised above the normal skin, bordering pricks and scratches — followed by a few watery blisters, containing a cloudy serous liquid; finally intense irritation, numerous blisters, and oozing inflamed patches are the result. The ooze is conveyed to other parts of the body; eyelids, lips, neck, etc., become involved, and the discomfort is great. Children will scratch the blisters open, and in severe cases there is loss of sleep and appetite.

The plant comes in for considerable blame anyway, but superstition and incorrect or inadequate observations have given rise to tales of: "once infected, the infection lasts seven years; it recurs every year! in fact it is almost hopeless!" This assumption is really nonsense. Yet one comes across such comments often enough in textbooks which should really know better. Poison ivy irritations are acute in the first place; none of the many children and grown-ups whom I have made it my business to watch have ever shown recurrence without re-infection. If skin troubles recur, they were not originally due to poison ivy. Yet there may be some truth apparently in the assumption that actual contact is not necessary. I doubt this, however, from mere lack of positive evidence. Nobody, of course, ever comes knowingly into contact with poison ivy. One such case is known to me, where afterwards I found a vase full of glorious fall-tinged poison ivy in the house — with two of the inmates suffering from a persistent "heat rash", with the usual poison ivy symptoms.

Not until one of my own children afforded me material for study and experiment did I become interested in the treatment of poison ivy. At first — as usual — every possible thing was tried, even medical opinions were sought. Pet remedies which everybody seems to possess were equally uselessly employed. Baking powder, sour milk, sulphur soap, lead water, lead acetate, boracic powder and lotion, calamine lotion, potass. permanganate, fatty and alcoholic substances, extracts of Grindelia, the fresh juice of Impatiens, were tried one after the other and results noted. None of these substances is a curative; some eased the irritation for a moment, others caused profuse oozing. The child was productive of wonderful patches until her shins were covered with one oozing, beady sore, 2 inches wide and 8 inches long. The usual precautions were taken. The child was not allowed to swim in the river, was cautioned and occasionally effectively prevented from scratching, but the dose of ivy poisoning persisted until the following treatment was resorted to. The oozing sores were washed perfectly clean with soap and water, followed by dubbing with 95 per cent alcohol — which latter did no good — but the sores were then dried with a clean absorbent towel and were painted over from one to three times with a cotton wool plug dipped into Tincture of Iodine — the usual B. P. tincture — although later on in cases of adults the Churchill tincture was often used. This application caused profuse oozing, and the ooze was absorbed by dusting with boracic acid powder. The application of the iodine tincture did not cause any pain other than that resulting from the actual mechanical touch. The smaller sores were treated just the same. After 24 hours most of the iodine stains had disappeared. The skin was again washed as before with soap and water, dried, and a second application was made, followed 6 hours later by a third. Careful attention was paid to any possible signs of iodine poisoning, such as redness or burns, or any effects from absorption of the drug, which is known to occur in certain individuals, but no untoward complication became noticeable, and the patches healed up, most of the minor ones after one good application, i. e. allowing the first to dry and painting again until a good deep-yellow, yet still light brown stain resulted. The sores on the shins had healed up after a week — three applications of tincture of iodine sufficed. During all this time the child was permitted to go in bathing with the rest of the children, without any ill effect to her or the others. The preliminary treatments, as described before the iodine was resorted to, are not necessary, as further experiments and observations proved. In not a single case of poisoning with poison ivy did I observe failure or ill effects, and a good

many have been kept under observation during the last three years.

In case there should result any skin irritation from the application of Iodine, an application of a starch poultice might be resorted to. Should any person fear the application of Iodine, it is suggested that it be not resorted to until the treatment is authorized by one's medical adviser.

In conclusion a word may be said about the eradication of this undesirable plant. Poison ivy will not be killed by a single cutting, as new shoots or suckers are persistently sent up from the root stocks. The root stocks must be exhausted by destroying the foliage as fast as it appears, either by repeated mowing or by spraying with a strong salt brine made at the rate of 3 pounds of common salt per gallon of water. If the weed is cut or sprayed in June and the treatment repeated about three times at intervals of 10 days or two weeks, the root stocks will become exhausted and die. Arsenate of soda (a violent poison), ¼ pound per gallon of water, or crude oil may be substituted for the salt spray. Spraying does not affect the roots directly, but is simply equivalent to cutting. However there is the advantage that one need not come into actual contact with the plant. Spraying with one pound of caustic soda dissolved in two gallons of water has been found very effective.

H. T. Güssow,

Experimental Farm, Ottawa.

NOTES ON THE NORTHWEST COAST HERON IN STANLEY PARK, VANCOUVER, B.C.

Having on numerous occasions seen herons flying over the City of Vancouver I had unsuccessfully endeavored to discover their nesting site, and was much pleased to hear, on June 9th last, that a number of herons were nesting in Stanley Park. Without delay and in company with two friends I visited the Park, and not far from Brockton Point found the heronry. It was situated in a very heavily timbered corner and the main nesting site was in a large spruce tree, this tree being about 250 ft. in height. We counted thirty-seven nests in this single tree, and about fifteen young birds were in view, either sitting up in the nests or perched on the branches of the tree. The young, which appeared to be half or three-quarters grown, kept up an incessant squawking, which increased fourfold whenever a parent bird appeared with food. The branches of this spruce tree, except for their tips, were devoid of foliage, and tree trunk, branches and nests were of a greyish-white colour from the birds' droppings. Much of the vegetation close to the ground under the tree was dead and everywhere the ground was littered with pieces of egg shells, filth, etc. I secured a number of egg shells, some of which were in excellent condition. Two nests and five young dead birds were found on the ground beneath the tree; two of these were about half grown, two about three weeks old, and the fifth about one week or ten days old. All five birds were more or less decomposed. These nests with the young had, no doubt, been blown down by a recent heavy wind and rain storm. One nest was complete and unbroken, and proved to be a bulky affair and of solid construction, the outer part being constructed of coarse branches about half an inch in diameter, while the inside was well made with fine twigs securely plastered together with refuse and excreta from the young birds. From the size, the nest must have been in use several years, each year having had a little added to it. It was between three and four feet in diameter outside, while the bowl measured eleven inches wide by five inches deep; the whole nest was of a greyish-white colour as if it had been whitewashed. Under the tree three lampreys were found, having, no doubt, been dropped by the birds when feeding; two of these fish measured 7½ inches and one 9½ inches, two were minus heads and the other lacked its tail. Several photographs were taken by one of my companions, Mr. Abbott, and in these the young birds can easily be distinguished.

About two hours were spent watching

these herons and during that period about twelve adult birds visited the tree with food



for the young. After feeding them they would sometimes rest for five or ten minutes before leaving again for their fishing grounds. Many of the young, which I estimated to number from sixty to eighty, constantly stood upright and exercised their wings back and forth. Two other nesting trees were close by and on these also young birds were noticed.

On June 13th the heronry was again visited and another nest was found on the ground. It contained three half-grown birds, all so badly fly-blown that I was unable to preserve them. One bird was weighed and scaled three pounds. Its iris was pale lemon-yellow; lower mandible yellow with upper edge dark horn colour; upper mandible, dark; upper part of tarsus sulphurous yellow with greenish cast, the balance of tarsus and toes dull bluish-grey; claws very dark. The bill measured at culmen 3.00 in., at gap 4.56 in., tarsus 4.50 in.

Several more photographs were taken. Thirty-six nests could be seen distinctly, and these, with the three found on the ground, made a total of thirty-nine nests in this particular tree. On June 9th five dead birds were found, and on the 13th another small one was located behind a log; it had been dead for a long time and was, no doubt, out of one of the two first nests found. About thirty-five young birds were in view on the 13th and careful scrutiny failed to reveal more than three birds in any one nest, the majority being two to each nest, while a few held but a single young bird. A fair estimate would place the number of adult breeding birds at from fifty to sixty. The parent birds who hunt for food along the shores of Burrard Inlet, Kitsilano, Point Grey and Sea and Lulu Islands only feed the young at long intervals.

A bald eagle was seen to approach the nests, when suddenly many of the old birds appeared from every direction and quickly drove away the unwelcome visitor.

At the time of writing, July 23rd, many of the young birds are flying, but return every night to the nesting tree. These herons fly at all hours of the night, and I very frequently hear them croaking to one another between the hours of ten and twelve at night, as they fly far overhead towards the Park.

The Stanley Park Heronry has during the past few weeks become one of the points of interest in the Park, and hundreds of residents of this city as well as visitors now stop to have a look at the curious bird colony, none of the members of which appear to be in the least disturbed, however many people gather about to watch them.

K. RACEY, 3262 First Ave. W.,
Vancouver.

BIRD CENSUS FROM LONDON, ONT.

BY E. M. S. DALE.
President, McIlwraith Ornithological Club.

For some years our Club has sent in reports to the "Bird Lore" Christmas census. The number of species observed has increased from seven in 1910 until now a limit seems to have been reached of some nineteen or twenty. This probably does not indicate more birds here during recent years, but rather growing efficiency on the part of a larger company of observers, combined with increased knowledge of the localities most favored by the birds in winter. It may be interesting to readers of the *Canadian Field Naturalist* to compare these lists which are annexed hereto in tabulated form.

	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
Horned Grebe								1			
Herring Gull				1				3	2		
American Merganser	15				22		2	20			2
Lesser Scaup				1							
American Goldeneye					2			10			1
Ruffed Grouse				1		1		2			
Marsh Hawk							1				
Cooper's Hawk				1							
Red-Shouldered Hawk											1
Sparrow Hawk									1		
Long-eared Owl										1	
Screech Owl						1		1			
Great Horned Owl								1			1
Kingfisher		1		1		1	1				1
Hairy Woodpecker			1				2	1	2		3
Downy Woodpecker			2		1	3	10	6	7	8	8
Bluejay		2		1	1	3	3	10	3	10	8
Crow	57	3	1	19	10	2500	312	1500	30	22	11
Redwinged Blackbird			1								
Pine Grosbeak	3										
Purple Finch					1	15	15	50		2	
American Crossbill									5		
Redpoll				3			45			55	
Goldfinch			1						1	1	
Pine Siskin										65	
Snowbird							100			20	5
Tree Sparrow		2			30	2	22	18	3	15	27
Junco	3	3	10	20	15	2	28	15	20		72
Song Sparrow					3		2	1	1	3	5
Cardinal							7	1	1	3	4
Northern Shrike			1				1	1	1		
Brown Creeper	1			5	1	2	7	4	5	7	2
Red-breasted Nuthatch			1		1					1	
White-breasted "		1	3	5	6	4	10	4	10	7	3
Blk.-capped Chickadee	6	9	6	28	5	25	78	42	39	87	26
Brown-capped "										1	
Golden-crowned Kinglet	10	1	2	4	7	2	10	12	2	15	27
Robin			2						1		
	7sp.	8sp.	12sp.	13sp.	14sp.	13sp.	19sp.	21sp.	18sp.	18sp.	18sp.
TOTAL INDIVIDUALS	95	22	31	90	105	2561	656	1703	134	323	207

NOTES AND OBSERVATIONS.

UNUSUAL MIGRATION RECORDS IN THE VICINITY OF MONTREAL—MARCH 1921.

No doubt the mild weather during the past winter, and the abundance of fruit and seeds (especially coniferous seeds) limited the movements of a great many Northern birds. Throughout South-Eastern Canada and the North-Eastern States, at least in urban districts, the dearth of birds appears to have been general. Of the customary winter birds the following were seen in the vicinity of Montreal in very small numbers: Snowy Owl (2); Saw-whet Owl (2); Hairy and Downy Woodpeckers; Snow Bunting; White-winged Crossbill; Pine Siskin; Goldfinch; Redpoll; Cedar Waxwing; White-breasted Nuthatch; Red-breasted Nuthatch; Black-capped Chickadee.

The unusual occurrences were: Herring

THE CANADIAN FIELD-NATURALIST

VOL. XXXV. GARDENVALE, QUE., October-December, 1921. No. 7.

A PRELIMINARY SURVEY OF THE BIOTA OF A SAND SPIT IN LAKE WINNIPEG.

By Chas. H. O'Donoghue, D.Sc., F.Z.S.

Professor of Zoology, University of Manitoba.

Early in July, 1918, I was enabled to make a short stay of eight days on Berens Island, Lake Winnipeg, through the courtesy of the Riverton Fish Company of Riverton, Man. I was accompanied by J. Nelson Gowanlock, B.A., Fellow in Zoology in the University of Manitoba, and we both desire to express our thanks to the company for a round trip of some 500 miles from Hnausa, taking in Berens Island, and also to the men at the fishing camp at Swampy Harbour for many favours.

The main object of the trip was to become acquainted with the general life conditions in the great tree belt of the "Canadian zone" which occupies such a large part of the Province of Manitoba. To this end a camping site was chosen on Berens Island which is situated well within that region and, save for a small corner, has not been interfered with by settlement. Further, the journey there and back allowed of short visits to a number of typical and practically undisturbed spots.

Adams (1) points out that for satisfactory ecological study only "repeated and prolonged visits, careful observations, and descriptions of the place and animals will enable one to acquire the desired familiarity." This was obviously impossible in a short stay, but the whole area was so full of interest that it seemed highly desirable to call attention to its possibilities, and, further, it was hoped that opportunities would occur later to revisit the spot or perhaps induce other people to do so and continue the work in a more satisfactory manner. This hope has not been realised, and the present paper makes no pretence at completeness but is intended to serve as an introductory survey.

The following notes relate particularly to a sketch of the life conditions on a sand spit of Berens Island. Similar spits occur at other places on the lake, but, so far as I know, none combine so fully two important considerations, namely accessibility and, at the same time, almost complete freedom from human interference. In Shelford's terms it is a "primeval or primary community" (7). Press of work has prevented their publication at an earlier date. It is hoped, however, that they will be of some interest and serve to call attention, *inter alia*, to the fact that practically no ecological studies have been carried out on the islands and shores of freshwater lakes in Northern Canada where the conditions differ greatly from those farther south.

Berens Island is one of the two large islands in the northern part of Lake Winnipeg and lies approximately in latitude 52 deg. 15 min. N. and longitude 97 deg. 15 min. W. Its greatest length is eight miles and its greatest width four. The north-west sandy shore stretches in a very shallow curve for about seven and a half miles and faces the north-west corner of the lake which is over 120 miles away. The remaining part of the coast is more indented and rocky and has a large rounded projection on the south corner. As is well known the eastern and western shores of Lake Winnipeg differ markedly in character owing to the nature of the formation on which they lie. The former is composed of the Laurentian rocks, and the latter of Cambro-Silurian and a certain amount of alluvial drift. Although the island lies nearer the eastern than the western shore, it is nevertheless inside the limits of the Cambro-Silurian but must lie very near the junction between the two. The island is well within the limits of the Canadian zone and its characteristic trees are the Spruce, *Picea mariana*, and the Tamarack, *Larix laricina*,

with one or two clumps of Silver Birch, *Betula alba* var. *papyrifera*, and groups of *Populus balsamifera*. It includes, at any rate, one large grass swamp and much muskeg, and is similar to most other islands in the lake. The climate is typical of that of the surrounding region, dry, much of the precipitation taking the form of snow in the fairly long winter. The lake all around is frozen for 5 months or so and the temperature may drop to —40 deg. F. or sometimes lower.

The southern portion of the north-west coast for 2—2½ miles is formed by a large spit of land continuing the general line of the coast and only separated from a well-wooded island known as Burton or Little Black Island by a narrow channel 30-40 yards wide. This main spit, therefore, includes between it and the south end of the island a large wide open bay. The spit is composed mainly of sand which on its western side takes the form of dunes rising fairly rapidly from the water but sloping more gradually on the eastern side. Near the main island the dunes are 15 to 20 feet high but the last part of the spit is almost flat. From the east side of the main spit two smaller spits are given off. The one nearer to the island runs first almost east then north-east and finally almost north back towards the island and

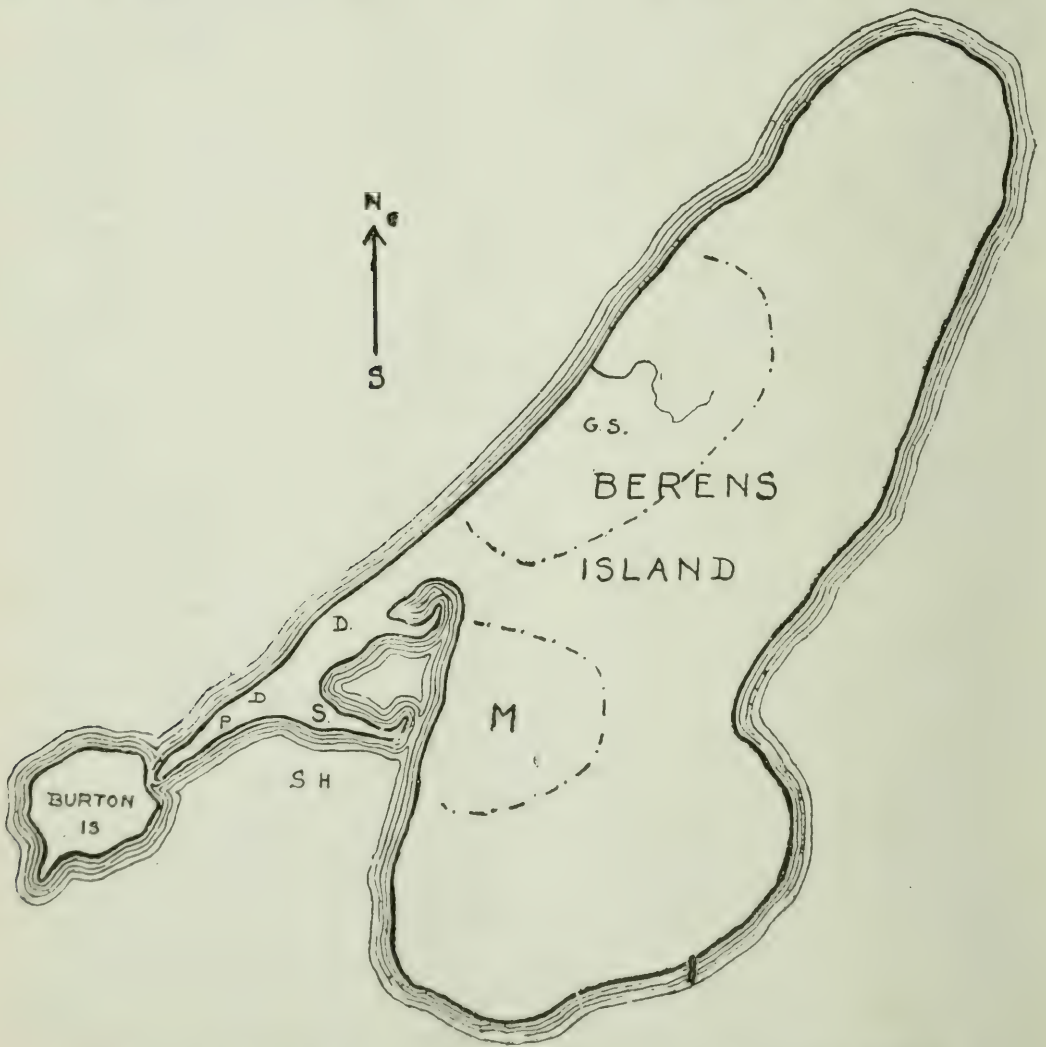


Fig. 1. — Rough sketch map of Berens Island. D, Dune area; G. S., large grass and reed swamp; M. muskeg; S. the spit on which the camp was pitched and the collections made; S. H. Swampy Harbour.

so encloses a sheet of water 150—200 yards wide and 200-300 long. The one farther from the island runs almost due east for nearly 500 yards and gives off at its extremity another smaller spit about 170 yards long pointing to the north. This second spit, therefore, encloses a still larger bay which includes the former spit, and this bay and its eastern end come over to within about ½ mile of the southern extremity of the island. In this way there is formed a very good harbour known to the fishermen as Swampy Harbour and for this reason the whole island is sometimes erroneously referred to as Swampy Island.

The main ridge and its side spits form an environmental complex that is in many ways similar to that on the shores of Lake Michigan in the vicinity of Waukegan, and its biota (total life content both animal and plant) must be on the whole fairly similar save for the effects of its more northern position and the somewhat different forest associations with which it is surrounded.

The observations were made on this second spit which has the form of an L and may be treated as a small ecological unit. Its long stem coming off from the main spit runs east by a trifle south, and is about 500 yards long by 100 yards wide. On each side it slopes off very gradually under the water, on the north to the inner bay and on the south to the outer bay. It has three crests running along it, the highest of which is about 7½ feet high and lies near the southern side. The short stem of the L is about 170 yards long by 23 yards wide and runs north by a trifle east. On the west side of this the water (of the inner bay) is very shallow, but on the east side it is deeper, particularly at the heel of the L, so that the fisheries steamer "*Lady of the Lake*" is able to run alongside a very short pier. At this point are the cleaning shed, the store house, bunk house and cook house used in both summer and winter fisheries by about a dozen men. The short stem of the L is used for work on the nets and boats, etc., and is sandy without any vegetation. Our own camp was pitched about half way along the spit. It is quite obvious that the spit is much younger than the main ridge from which it springs, for while the latter has several groups of fair-sized poplars, *Populus balsamifera*, the former has only much smaller ones, and the largest of these occur at the place where it comes off the main stem. It therefore represents a comparatively recently formed spit of sand and fine shingle that is being established and overgrown by vegetation.

The most striking feature is the manner in which the plants are arranged in rows parallel with the axis of the spit, each row characterised by the presence of a particular species or group of species. On standing at either end and looking along the spit this cannot fail to be remarked, for it almost looks as if it were arranged and was commented on by two of the fishermen quite independently. About eleven of these zones can fairly readily be distinguished and may be named according to the prominent vegetation characterising them. Thus, starting on the south, we have:—

A 23 feet shore sand zone
B 21 " zone of soft sand
C 25 " artemisia zone
D 29 " vetch zone
E 28 " golden-rod zone
F 25 " rose zone
G 31 " astralagus zone
H 21 " second vetch zone
J 45 " willow and poplar zone
K 13 " grass zone
L 40 " shore sand zone

To which may be added

M the water zone on the inner side.

The grasses extend through nearly all the zones, but in K they are very close and are the only noticeable plants; they form the main part of the vegetation of zone J. The two shore zones are partly covered when the water is high, and were probably submerged in 1916 and 1917 when the whole lake level was slightly higher than in 1918.

The following table gives an idea of the zonation. It provides a list of the plants found and the zones in which they were distributed. To convey some idea of the amount of vegetation present, letters have been employed. They are by no means accurate, but time was too short to allow of taking unit counts. Thus "extremely common" means that the area was well covered with the species and n. c. means that examples only occurred here and there, often as stragglers from the next zone. "Rare" is meant to indicate that only a few specimens occurred on the whole length

PLANTS		ZONES										
FAMILY	SPECIES	C	D	E	F	G	H	J	K	L	M	
Equisetaceae	*Equisetum arvense* L.		r	nc	r	r	ec	r				
Najadaceae	*Potomogeton interior* Rydb.										vc	
	" *richardsonii* "										nc	
Gramineae	*Alopecurus pratensis* L.						r	ec				
	Calamagrostis canadensis [Michx. Beauv.	nc	nc		nc							
	Deschampsia caespitosa "		c	c	c	r						
	Hordeum jubatum L.		nc	r			nc	ec	c			
	Poa triflora Gilib.		nc	r								
Cyperaceæ	*Carex aquatilis* Wahlenb.							r	ec			
	" *bebbii* Olney.		nc	c	nc			c				
	" *viridula* Michx.							nc				
	Eleocharis acicularis L.							r	ec	vc		
	" *palustris* L.							c	ec	nc		
Lemnaceæ	*Lemna trisulca* L.										r	
Juncaceæ	*Juncus balticus* Willd. var. [*littoralis*						r	c	ec	r		
Salicaceæ	*Populus balsamifera* L.			nc	nc			c				
	Salix candida Flugge						nc	nc	nc			
	" *discolor* Muhl.		nc		nc		nc	nc	nc			
	" *longifolia* Muhl.		nc		nc	r						
	" *lucida* Muhl.		nc		nc		nc	nc	nc			
	" *peltita* Anders.			nc				nc				
Urticaceæ	*Ulmus americana* L.							r(1)				
Polygonaceæ	*Polygonum aviculare* L.								nc	vc		
	" *Persicaria* L.								nc			
Chenopodiaceæ	*Chenopodium album* L.								nc			
Caryophyllaceæ	*Stellaria longipes* Goldie				r			nc				
Ranunculaceæ	*Anemone canadensis*						r	nc				
	Ranunculus flammula L. var [*reptans* Mey.							nc				
	' *macounii* Brit.							nc				
Rosaceæ	*Fragaria vesca* L.			nc	nc		vc	nc				
	Potentilla Anserina L.			nc						nc		
	" *rivalis* Nutt. var. [*pentandra* Wats.						c	r				
	Rosa blanda Ait.		r	nc	ec	r	nc					

PLANTS		ZONES									
FAMILY	SPECIES	C	D	E	F	G	H	J	K	L	M
	Rubus idæus L. var. *strigosus* [Max.			r	nc						
Leguminosæ	*Australagus aboriginorum* Rich.	r	r	nc	nc	ec	nc	r			
	Lathyrus maritimus L.	r	nc				nc				
	Vicia americana Muhl.		vc	c	c	nc	vc				
Anacardiaceæ	*Rhus glabra* L.				r(4)						
Onagraceæ	*Oenothera biennis* L.				nc	r	nc		r		
	" sp.				r		nc				
Haloragidaceæ	*Myriophyllum spicatum* L.										nc
Umbelliferæ	*Sium cicutæfolium* Schr.			c	nc			c	r		
Cornaceæ	*Cornus stolonifera* Michx.		r(1)	r(1)	r(1)			r(1)			
Labiatæ	*Mentha arvensis* L. var. *cana-densis* Bri.							nc			
Compositæ	*Achillea millefolium* L.			nc							
	Artemisia caudata Michx.	nc	nc		nc	c	c				
	Solidago canadensis L.		nc	ec	c			nc			
	" sp.		nc	c	nc			nc	nc		

ec extremely common. vc very common. c common. nc not common. r rare.

of the zone. It will be obvious, of course, that the term "very common" has quite a different value in numbers of plants to a unit area when applied to say roses and grass.

The plants were kindly identified for me by Mr. C. W. Lowe of Winnipeg.

The foregoing list is typical of the flora of sandy areas in the region of Lake Winnipeg with perhaps the possible exception of *Astralagus aboriginorum*. This does not appear to be common in the province and is listed by Rydberg (6) as a mountainous or sub-mountainous species and is not stated to occur in the province by Gray (2).

While it is true that on the whole the zonation is striking in its regularity, there are two noteworthy exceptions. Firstly, at the east end in the neighborhood of the camp which has been used both in summer and winter for some years, the zones are mixed. There are one or two old camp sites and frequently dog teams are tethered at this point. Apart from this, however, there is a large clump of willows extending across several zones and these give shelter to plants — *Anemone canadensis, Achillea millefolium, Rubus idaeus* var. *strigosus* and *Fragaria vesca* — not at all common elsewhere.

Secondly, at the end where the spit joins the main ridge there is a transverse ridge of limestone pebbles which are overgrown with lichens, including *Cladonia pyxidata,* and are obviously older than the remaining part of the ridge. Among the pebbles, remains of a few Ammonites (*) were found but they were too worn and broken to be identified. This partly juts into the daughter spit, noticeably at zone H, and partly also at G and K, and the west end of these zones include part of the zonation of the main ridge. The plants here, *Popu-*

* These appear to be Maclurea and perhaps M. Manitobaensis.

men are camping there they have one or more dog teams about.

Family Sciuridae.

No actual specimen was taken or seen but near the camp were tracks which I think belonged to:—

Sciurus hudsonicus Erxleben.

Citellus franklini Sabine.

Family Muridae.

Peromyscus maniculatus arcticus, Mearns, the arctic deer mouse. Two specimens were taken at the camp.

One of the fishermen reported having seen a ground squirrel — presumably *Citellus franklini* — and the mouse was not uncommon.

On the main island tracks of the lynx, *Lynx canadensis*, and the fox, *Vulpes fulva*, were encountered, but not on the spit, and one evening a timber wolf, *Canis occidentalis*, was seen on the island opposite the spit.

CLASS AVES.

Somewhat fuller notes are provided in the case of the birds since Mr. J. N. Gowanlock was particularly interested in them. I here wish to express my thanks to him for his assistance in this matter. The numbers are those of the *Catalogue of Canadian Birds*. (5)

ORDER LONGIPENNES.

Family Laridae.

(51.) *Larus argentatus* Pontoppidan, Herring Gull. A common visitant fishing along the shores of the spit. Groups sometimes alighted to sun themselves along the southern side.

(54.) *Larus delawarensis* Ord. Ring-billed Gull. Associated with but in lesser numbers than the preceding.

(64.) *Sterna caspia* Pallas, Caspian Tern. The nearest breeding-place of these birds was on Pelican Island and on only two or three occasions were individuals (in one instance a dozen or more) observed passing over the spit in company with the two following species.

(69.) *Sterna forsteri* Nuttall. Forster's Tern. Constantly in search of fish, these birds occurred along the waters bordering the sandspit.

(70.) *Sterna hirundo* Linnaeus. Common Tern. Like the last, this bird fished regularly along the shores of the sandspit,

lus balsamifera, *Equisetum arvense* and some grasses, seem to be invading the daughter spit.

The whole spit is exposed and the plants not so advanced as in more sheltered parts. Thus while roses, *Rosa blanda*, were in flower on Big Island on July 5th, the first one to come out on the spit was on July 10th. Again, ripe strawberries were common on Big Island on the same day but did not ripen plentifully on the spit until July 12th. It is, of course, not protected by trees and so exposed to the winds; this was a decided advantage, for the camp was practically free from the mosquitoes which are such a pest on the main part of the island.

One of the most striking features in the distribution of the plants is that on each side we have zones that are well covered with plants, i.e. D, E and F on the south and J and K on the north, while G and H between them are very sparse indeed. If we rule out the invasion at the west end and the poplar clumps at the east they are almost bare. B in particular is sandy and has all along it a line of drift showing that within the last few years it was the shore of the inner bay. Drift is also found on the inner side of H.

ANIMAL LIFE.

As might be expected the animal life on such an area is not extensive, but a number of different forms were taken.

While an attempt was made to identify the specimens and a number were actually identified, I soon realised that in the absence of ready access to a large library and well stocked museum, the task could not be satisfactorily accomplished. I therefore threw myself on the generosity of my fellow-scientists who, without exception, gave me their assistance. In each case I have cited the authorities responsible for the determination of the species. The United States National Museum, Washington, through the kind offices of Dr. Aldrich were good enough to identify many of the insects, and the name of the particular expert, followed by U. S. Nat. Mus., is associated with the forms they determined.

CLASS MAMMALIA.

Mammals were rare on the point, perhaps owing to the fact that whenever the

especially over the shallower waters of the inner bay.

ORDER STEGANOPODES.

Family Phalacrocoracidae.

(119.) *Phalacrocorax auritus auritus* Lesson. Double-crested Cormorant. Noted once, flying over the sandspit, three individuals in company with ducks.

Family Pelecanidae.

(125.) *Pelecanus erythrorhynchos* Gmelin. White Pelican. From one to eight or more of these birds fished partically every morning and evening in the inner bay and on one occasion one was encountered on the spit itself three-quarters of the way to the fish-station.

ORDER ANSERES.

Family Anatidae.

(132). *Anas platyrhynchos* Linnaeus Mallard.

(139.) *Nettion carolinense* Gmelin Green-winged Teal.

(140.) *Querquedula discors* Linnaeus Blue-winged Teal.

These three species were frequently noted passing in flight over the spit, especially at evening.

(149.) *Marila affinis*, Eyton, Lesser Scaup Duck. A few seen in the evenings a short distance from shore.

ORDER PALUDICOLAE.

Family Rallidae.

(214.) *Porzana carolina* Linnaeus. Sora Rail. The characteristic notes of this rail were heard at the marshy portion of the spit toward Plover Point.

ORDER LIMICOLAE.

Family Scolopacidae.

(239.) *Pisobia maculata* Vieillot. Pectoral Sandpiper. Noted several times feeding along the beaches of the spit.

(254.) *Totanus melanoleucus* Gmelin Greater Yellow-legs. Noted on the spit.

(256.) *Helodramus solitarius solitarius* Wilson. Noted quite regularly along the inner shore of the sandspit, especially in the evening.

(263.) *Actitis macularia* Linnaeus. Spotted Sandpiper. Noted several times on the beaches of the spit.

Family Charadriidae.

(273.) *Oxyechus vocifer us* Linnaeus. Killdeer. Noted feeding along the beaches of the spit.

(277.) *Aegialitis meloda* Ord. Piping Plover. Noted one morning along the outer beach. Nested at Plover Point, where parents and young were collected.

ORDER RAPTORES.

Family Buteonidae.

(331.) *Circus hudsonius* Linnaeus. Marsh Hawk. Observed passing over point several times and on one occasion it was noted quartering near the camp in search of prey.

ORDER COCCYGES.

Family Alcedinidae.

(390.) *Ceryle alcyon* Linnaeus. Belted Kingfisher. This conspicuous bird was a rather infrequent fisher along the inner shoreline of the sandspit.

ORDER MACROCHIRES.

Family Caprimulgidae.

(420.) *Chordeiles virginianus* subsp. Gmelin. Nighthawk. This species was a regular visitor on the spit near camp at evening, a half a dozen or more being noted or heard at one time.

ORDER PASSERES.

Family Coracidae.

(488). *Corvus brachyrhynchos b achyrhynchos* Brehm. Crow. Flocks composed of as many as a hundred individuals regularly visited the beaches of the sandspit in search of dead fish. Single individuals could be observed in the vicinity at almost any hour of the day but the large flocks usually came at evening and morning.

Family Icteridae.

(495). *Molothrus ater* Boddaert. Cowbird. Noted as a visitant about the camp.

(497). *Xanthocephalus xanthocephalus* Bonaparte. Yellow-headed Blackbird. This species was noted several times around camp, usually together with one or both of the following blackbirds.

(498.) *Agelaius phoeniceus* subsp. Linnaeus. Noted as a visitant on the sandspit.

(511b). *Quiscalus quiscula aeneus* Ridgway. Bronzed Grackle. A common species

on the spit, it probably bred somewhat south of the camp earlier in the season.

Family Fringillidae.

(542). *Passerculus sandwichensis* subsp., Gmelin. Savannah Sparrow. This species was the commonest sparrow on the spit where it appeared to be nesting in the scattered shrubs some distance from camp on the inner shore. At any rate four pairs were actually found nesting on the spit.

(560). *Spizella passerina* Bechstein. Chipping Sparrow. A resident, but not numerous, along the inner face of the sandspit.

(567). *Junco hyemalis* Linnaeus. Slate-coloured Junco. Juncoes were several times noted as visitants to the spit, probably coming from their breeding places across the inner bay.

(581). *Melospiza melodia* subsp. Wilson. Song Sparrow. The Song Sparrow was a resident in fair numbers along the sandspit.

(584). *Melospiza georgiana* Latham. Swamp Sparrow. Noted several times on the spit.

Family Bombycillidae.

(619). *Bombycilla cedrorum* Vieillot. Cedar Waxwing. Flocks of from five to twenty Waxwings very frequently visited the spit. The species did not appear to have begun nesting at this time.

Family Vireonidae.

(624). *Vireosylva olicacea* Linnaeus. Red-eyed Vireo. Widely distributed throughout the whole Lake Winnipeg region, the Red-eyed Vireo frequently visited the spit. It nested commonly across the bay.

Family Mniotiltidae.

(652). *Dendroica aestiva aestiva* Gmelin. Yellow Warbler. Resident on the spit; the Yellow Warbler was, however, much less numerous here than on the inner portion of Plover Point.

(657). *Dendroica magnolia* Wilson. Magnolia Warbler. Noted as an infrequent visitant on the spit.

(660.) *Dendroica castanea* Wilson. Bay-breasted Warbler. Noted once in shrubs on the spit.

(662). *Dendroica fusca* Müller. Blackburnian Warbler. This species which bred commonly on other parts of the island was several times observed on the sandpoint.

(675a). *Seiurus noveboracensis notabilis* Ridgway. Grinnell's Water Thrush. Observed frequently feeding singly along the inner shore line.

(687.) *Setophaga ruticilla* Linnaeus. Redstart. A common nesting species across the island, the Redstart was noted several times as a visitant on the sandspit.

Family Sittidae.

(727.) *Sitta carolinensis* subsp. Latham. White-breasted Nuthatch. Observed once or twice on the spit.

Family Paridae.

(735). *Penthestes atricapillus septentrionalis* Harris. Long-tailed Chickadee. A common breeding species in woods across the bay, the Chickadee not infrequently visited the sandspit in its characteristic wanderings.

Other interesting birds were encountered during the trip, some of which have been reported previously (4).

CLASS REPTILIA.

No reptile was actually found on the spit but a larger specimen (about 32 in. long) of the Garter Snake was taken on the main island opposite the end of the spit. So far as I know this is the most northerly point in the province from which this species has been recorded. I should judge that it is by no means common, for, on the news of its capture reaching an Indian camp at the end of the island, the Indians came over and solemnly requested to be shown the snake which some apparently then saw for the first time.

Family Colubridae.

Thamnophis sirtalis parietalis Say.

CLASS AMPHIBIA.

The amphibia were not found as a rule on the spit which was dry, but lived in the damp grass marsh of the main ridge. Often in the evening they would come out on the shore of the spit and the following were taken there.

Family Bufonidae.

Bufo hemiophrys Cope. Quite common.

Family Hylidae

Pseudacris septentrionalis Boulenger. Rare, 1 specimen.

Family Ranidae.

Rana pipiens Schreiber. Not common.

CLASS INSECTA

Insects, while abundant on the island, were not very common on the spit. Unfortunately, time did not allow the taking of satisfactory notes, and also in several instances the preservation was so bad as to prohibit the accurate determination of the species. Some interesting forms were encountered.

ORDER ODONATA.

Dragon flies were plentiful on the island but the only species taken on the spit was *Nehalennia irene* Hagen (B.P. Currie, U.S. Nat. Mus.)

ORDER NEUROPTERA

The following were taken on the spit but their faulty preservation did not allow of an accurate identification.

Limnephilidae, 2 species; Phryganea, 1 species; Ephemeridae, 1 species (immature) (A. N. Candel, U. S. Nat. Mus.)

ORDER ORTHOPTERA

A number of grasshoppers were taken but all of them were in an immature condition and all belonged to the genus Melanoplus. They were kindly identified for me by Mr. Norman Criddle of Treesbank, Manitoba, as follows:—

Melanoplus atlantis, M. dawsoni and *M. femur rubrum* or *angustipennis.*

ORDER HEMIPTERA

The following were taken:

Capsus ater, adult and young; *Nabis* sp. nymph; several specimens of family Corixidae not identified. (W. L. McAtee, Biological Survey, U. S. Nat. Mus.)

ORDER LEPIDOPTERA.

Family Nymphalidae, *Brenthis aphirape* var.*dawsoni; Phyciodes tharos* Drury; *Basilarchia dissipus* Godart; *Basilarchia arthemis* Drury var. *lamina* Fab.

Family Papilionidae, *Papalio machaon* (L) var. *aliaska* Scudder.

Family Sphingidae, *Smerinthus cerisyi* Kby.

Family Noctuidae, *Acronyta* (*Apatela*) *dactylina* Grote; *Hadena allecto.*

Family Notodontidae, *Phaeosia rimosa* Pask.

Family Geometridae, *Rheumaptera hastata L.*

In addition the larvae of *Malasosoma fragilis* Stretch and a number of unidentified Noctuids were collected. The stems of a number of the Goldenrods were parasitised by *Gnorioschema gallaesolidogi-nis* Riley.

ORDER DIPTERA.

The Diptera were kindly identified for me by Dr. J. M. Aldrich of the United States National Museum as follows:—

Tabanus affinis, Kirby; *Tabanus septentrionalis,* Loew; *Haematopota americana,* O. S.; *Chrysops carbonaria,* Walker; *Chrysops lupus,* Whitney; *Sphaerophoria scripta,* L.; *Phormia regina,* Mg.; *Phormia terrae-novae,* R. D.; *Cynomyia cadaverina,* R. D.; *Hylemyia tricho-dactyla,* Rond; *Anthomyia radicum,* L.; *Lispa* sp.; *Spathiophora fascipes,* Beck; *Sciomyza simplex,* Fall; *Camptoprosopella vulgaris,* Fitch; *Dicraeus incongruus,* Ald.; *Anarostoma marginata,* Loew; *Fucellia maritima,* Halliday; and a new genus and species of the family Sapromyzidae. The Tipulidae and Chironomidae were not well enough preserved for identification.

Dr. Aldrich has called attention to several interesting forms in the foregoing list.

The fly *Hydrophorus agalma* Wheeler is of considerable interest; it has only been recorded so far from Battle Creek, Mich., the type locality, and from Ridgeway, Ont. It belongs to a very abundant family the Dolichopodidae, whose larval stages have up to the present almost wholly escaped observation. In North America so far the larval stage of only one species, *Thryptiens muhlenbergiae* Johannsen, is known and this is a stem-miner in plants very different from the present species.

The specimens were taken in water only a few inches deep on the north side of the spit where it joined the main ridge. The bottom here is a mixture mainly composed of sand with a little mud, and owing to its sheltered position is practically undisturbed. Unfortunately, owing to lack of time, no satisfactory observations were made on the life history of this form. The larvae build for themselves cocoons of the sand about 8 mm. long and in these also they pupate so that the cocoons collected contained both larvae and pupae. How or

when the flies escape from the cocoons was not ascertained, but from the position they were in it is clear that a slight fall in the level of the lake such as follows a change in the wind or comes naturally in the hot summer weather would leave the cocoons on the dry sand and probably the flies would escape at such a time. This habit of forming sand cocoons is apparently unique, for there is no record in Europe of the early stages of this genus (nor indeed of any other genus forming sand cocoons), and the species would doubtless repay further study.

Spathiophora fascipes Beck, is a European species that has been recorded in North America only from one locality on the shores of Lake Erie and two on Lake Michigan.

Amorostoma marginata Loew, is a form that is very difficult to see. It lives on the bare sand of the dunes of the main ridge and the sandy shore line of the spit. An allied species *A. maculata* lives in a similar habitat at Pacific Grove, California.

Fucellia maritima Halliday is also of considerable interest since it is normally a sea shore form breeding in decaying seaweeds. It is abundant on the eastern coast of the United States as far south as Cape Hatteras and on the West coast of Europe. While it has been found occasionally inland in Europe, it has only been reported by Malloch from Waukegan, Ill., on Lake Michigan, and the United States National Museum until now had no specimens from any inland water. It is to be noted that the sand beaches of this area are very similar to the spit on which the species was taken.

Four specimens of a Sapromyzid fly were taken, which Dr. Aldrich informs me belong to a new genus and new species that he hopes he will be able to describe shortly.

ORDER COLEOPTERA.

The Coleoptera were kindly identified for me by Mr. J. B. Wallis, of Winnipeg, as follows:—

Family Cicindelidae, *Cicindela duodecimguttata* Dej. var. *bucolica*, Casey; *Cicindela hirticolis* Say; Family Cambidae, *Bembidion carinula* Cho.; Family Omophronidae, *Omophron tersalatum* Say; Family Dytiscidae, *Ilybius angustior* Gyll; Family Gyrinidae, *Gyrinus maculiventris* Lec; Family Silphidae, *Silpha trituberculata* Kby; Family Staphylinidae, *Creophilus maxillosus* var. *villosus* Grav; Family Histeridae, *Saprinus fraternus* Say; Family Phalaeridae, *Olibrus semiatriatus* (?) Lec; Family Coccinellidae, *Coccinella perplexa* Muls (?) *trifasciata* L; *Coccinella transversoguttata* Fald; Family Scarabaeidae, *Phyllophaga anxia* Lec (dubia Smith); Family Chrysomelidae, *Calligrapha multipunctata* Say; *Galerucella nymphaeae* L; *Trirhabda netidicollis* Lec (larva of this or closely related species—A. O. Boviry, U. S. Nat. Mus.); Family Curculionidae, *Hylobius confusus* Kby.

The tiger beetles *C. histicollis* were seen occasionally on the beach in the bright sun but proved difficult to catch. On July 12th, 13th and 14th they were more plentiful and many pairs were copulating. When disturbed they do not separate but fly together, the male, as far as could be seen, carrying the female. This made the flight slower and the insects more easy to capture. They were not seen so plentifully although July 16th was apparently an ideal day. The species is not at all common in the province and local in its distribution.

The beetles *C. multipunctata* were extremely common on the willow bushes and all stages from eggs to perfect forms were obtained on July 10th. Certain small bushes they entirely stripped of leaves and their choice of species was marked. They attacked mainly *Salix lucida* and *S. discolor*, less frequently *S. longifolia*, and never *S. peltita* or *S. candida*. In one case, even when practically all the leaves of a small *S. lucida* were eaten, they did not attempt to eat those of an *S. candida* the twigs of which were actually mixed with and touching their food plant.

The species *Creophilus villosus* was found entirely in the shed where the fish were cleaned and packed and was quite common there.

Phyllophaga anxia was not taken at first, but during the evening of July 8th large numbers of them were flying about and probably a hundred or two dropped into the camp fire. The next day they were found on the spit, but not at all plentifully. On the evening of the 10th they were again flying in large numbers and fell into the fire. It would appear as if they were in course of migration, for only a very few were found after that date.

It will be noticed that in quite a number of cases the foregoing list of beetles, small though it is, extends the recorded range of most of the species as given by Leng (3).

ORDER HYMENOPTERA.

The following were taken but mostly not well enough preserved for accurate identification.

Larva of a saw-fly Tenthredinidae (E. A. Schwarz, U. S. Nat. Mus.)

Camponotus herculeanus L (W. M. Mann, U. S. Nat. Mus.)

Nematus erichsoni Htg; *Bombus* sp.; *Megachile* sp.; *Adrena* sp.; *Sphex fragilis* Sm.; *Sphex uruaria* Dahle; *Chelonus* sp.; *Pteronidea* sp. (S. A. Rohwer, U. S. Nat. Mus.); *Zaleptopygus incompletus* Prov.; *Adiastola* sp. (R. A. Cushman, U. S. Nat. Mus.).

CLASS ARACHNIDA.

Dictyna volupis Keys; *Clubiona riparia* Koch; *Tetragnatha laboriosa* Hentz; *Meta menardi* Latr.; *Epeira trivittata* Keys. (C. R. Shoemaker, U. S. Nat. Mus.)

MOLLUSCA.

Zone L slopes up gradually from the water and the slope is continued in K, but it reaches its apex there and drops slightly before passing over into zone J. In this small inner slope of zone K, particularly at the west end, are groups of the shells of molluscs probably deposited there a year or so before when the lake level was higher. From these the following have been kindly identified by Dr. F. C. Baker of Illinois.

ORDER PULMONATA.

Family Lymnaeidae, *Lymnaea stagnalis appressa* Say; *Galba obrussa decampi* Say; *Galba catascopium* Say; Family Planorbidae, *Planorbis binneyi* Tyron; *Planorbis parvus* Say; Family Physidae, *Physa* sp.; Family Valvatidae, *Valvata sincera* Say; *Valvata lewisii helicordea,* Dall; *Valvata tricarinata* Say.

ORDER EULAMELLIBRANCHIATA.

Family Sphaeridae, *Sphaerium fabale* Prime.

Some of these were also taken alive but all obviously occur in the water round the spit.

SUMMARY.

Little remains to be added in the way of a summary since the work itself constitutes a record of the plants and animals obtained. These include at any rate 48 plants belonging to 21 families and 127 animals widely scattered in different classes, besides a number of others not identified; this number, taking into account the small area and the limited time, gives an idea of the possibilities of the district. It represents one stage in the seasonal changes of the spit, since all the actual collecting was done within a day or so and naturally, as the facies of the habitat changes in the passage of the year, the animals will also change not only in their relations to one another and to the plants and to the stage of their life history but also in the actual species present. Some species will remain throughout, others will disappear and yet others will be represented that were not found at the time. Most of the species are probably to be regarded as stable components of the life complex of the spit, but certain forms, such for example as the beetle *Polyphylla anxia,* appear as if they were simply migrants. No doubt more prolonged study would have revealed further species at the time and would certainly have added considerably to the life history of the forms obtained. This interesting spit would well repay more detailed study.

LITERATURE CITED.

1. Adams, C. C.—*Guide to the Study of Animal Ecology,* New York, 1913.
2. Gray, A.—*New Manual of Botany,* 7th Edition, New York, 1908.
3. Leng, C. W.—*Catalogue of the Coleoptera of America North of Mexico,* New York, 1920.
4. O'Donoghue, Chas. H. and Gowanlock, J. N.
 Notes on the Caspian Tern (*Sterna caspia*) and the Parasitic Jaeger (*Stercorarius parasiticus*) in Manitoba. *Canadian Field-Naturalist,* Vol. XXXIII, April 1919.
5. Macoun, J. and Macoun, J. M. *Catalogue of Canadian Birds,* Ottawa, 1909.
6. Rydberg, P. A.—*Flora of the Rocky Mountains and Adjacent Plains,* New York, 1917.
7. Shelford, V.E.—*Animal Communities in Temperate North America.* Chicago, 1913.

A FAIRY-SHRIMP NEW TO CANADA AND WESTERN NORTH AMERICA

By FRITS JOHANSEN.

Since my article on Canadian and Alaskan fairy-shrimps was published in the *Canadian Field Naturalist*, February, 1921, I have had the great pleasure of receiving from Mr. and Mrs. T. L. Thacker, of Little Mountain, Hope, B.C., records that they have kept of fairy-shrimps observed and collected in Southern British Columbia, together with samples of the specimens. They prove to be the well-known form *Eubranchipus vernalis* Verrill, hitherto not recorded from Canada and the United States west of Indiana. In my article cited above I have mentioned this species, pp. 24, 27, as one that possesses a wide distribution in the United States, occurring only during the winter and early spring.

While the genus *Streptocephalus* (see p. 29) was established already by Baird, in 1854, the genus *Eubranchipus* does not occur outside of North America, and was founded by Verrill, in 1869, in describing *E. vernalis* for the first time.

Mr. Thacker's records of *E. vernalis* from British Columbia follow:

Hope, B.C.: Sloughs in orchard at Little Mountain, through hole in ice, March-April, 1918 (plentiful March 10 and April 1; only one specimen March 13, 24, and April 21, 28). None secured by fishing there on May 26 and June 26, 1918.

Same place, in 1920: none secured on Jan. 18 and Feb. 17; one young on Feb. 22.

Slough at Haig, Feb. 11, 1920; plentiful.

Craigdorroch Gardens, Victoria, Vancouver Island: few females with egg-bags in pond, Feb. 14, 1920.

According to Verrill and Packard this species reaches a length of 23 mm. in both sexes; and in life the body is of a pale flesh colour, with a deep, reddish-brown colour as a narrow streak widening from the genital organs to the posterior half of the abdomen. The hairs upon the cercopods are white, as are also the tips (endites) of the basal part of the foliaceous legs. These red-brown and white colours are the most conspicuous ones when the animal is seen in the water.

The female is easily distinguished from that of *E. gelidus* (see p. 28), by not having the ninth and tenth body-segments produced into lateral processes, though the egg-sac is similar, not so long as broad. The male is also easily distinguished from that of *E. gelidus* by having the frontal (accessory) organs much shorter, broader, and flatter, triangular in shape and acutely pointed, with the edge finely serrated. Except when in use they are hidden by the much longer claspers (2nd pair of antennæ), which have a stout basal joint and a chitinous terminal joint resembling a Turkish sword, with a long obtuse spur on the inner side, basally, beyond which the joint is triangular, with the extremity bent outward somewhat like the foot of a sock before it is worn. These specific characteristics are illustrated in Packard's monograph (1883), Plates XI, XXII.

The nauplii (no figures given) were successfully hatched by the two brothers Hay (*Amer. Natural.*, Vol. 23, 1889, p. 91), (1), from egg-bearing females secured in April, that soon died. The eggs were kept in the dry mud all summer; and when at the end of September they were covered with water, they immediately rose to the surface, remained there for a couple of days, and then again sank to the bottom. In the beginning of October a number of nauplii came forth; they were paler and more transparent than is generally the case with nauplii of fairy-shrimps. Also they seemed to leave the egg in a more advanced stage as a "meta-nauplius" than other fairy-shrimps (there were traces of the first 3-4 pairs of foliaceous legs, and of the paired eyes), thus recalling the just hatched *Lepidurus* (see p. 45).

This species was first recorded by Gould (*Rep. on Invertebr. of Mass.*, Cambridge, 1841), who states (p. 339) that they are found in stagnant pools in Massachusetts, but wrongly referred them to the European species *Branchipus stagnalis* L. Verrill (*Proc. Am. Ass. Adv. Sc.*, 1869) was the first to call attention to this, describing it as *E. vernalis* and recording it in addition from Connecticut. It has later been found also in Rhode Island, Long

Island, Pennsylvania. Ohio and Indiana (Hay, Notes on Some Freshwater Crustacea, etc., *Amer. Natural.*, Vol. XII, (16); Packard (1883), etc.) The dates upon which it has been observed range there from the middle of November to the middle of May; and from the date available it seems that the eggs hatch when the dried-up pools in which they have been deposited become filled with rain-water in the late fall, or with melting-water in the early spring. The larvae then grow to maturity in a month or so, attaining that state in December (January), or April (May), as the case may be. From the new records from British Columbia given here it would appear that their "season" in Western Canada (at least in the mountainous parts) is shorter (say from January to April), beginning later and ending sooner than in eastern United States.

Packard's theory ("Occurrence of the Phyllopod *Eubranchipus* in winter" *Amer. Natural.*, Vol. XII, 1878, p. 186), that it attains maturity in the autumn is not borne out by any observations.

In spite of its frequency during the winter in eastern United States, where it is the most typical fairy-shrimp, no new data about its biology have been published, so far as I know, for the last thirty years; and we do not yet definitely know the number of broods during the time it occurs there. It is probable that there are two generations, one hatching after the fall-rains, the other after the melting of the snow in the spring.

A hermaphroditic specimen of this species was found by Dr. C. F. Gissler, in January, 1880, in a pool near Maspeth, Long Island, together with many normal individuals of the same species. It is described and figured by him in the *Amer. Naturalist*, Vol. XV., 1881, p. 136-39. In the same volume is another article by Dr. Gissler about the influence of the chemico-physical nature of the particular pond upon the colour and development of the *E. vernalis* it contains; it establishes a red and a white colour-variety which do not cross.

I take this opportunity of correcting a statement I made in these articles (Vol. 35, p. 41). The genus-name *Apus* was established by Schaeffer in 1752, and that of *Lepidurus* by Leach in 1816. The Euphyllopoda were first placed among the insects, before it was recognized that they belonged to true crustaceans.

(1) In the same paper **E. gelidus** is described for the first time.

BIRDS THAT ARE LITTLE KNOWN IN MANITOBA.

BY NORMAN CRIDDLE,

Treesbank, Manitoba.

The following notes are presented in order to record observations relating to some of the rarer birds found within the boundaries of Manitoba. Most of the species have been recorded before, but as they were considered rare at the time of record additional information concerning them seems desirable.

FERRUGINOUS ROUGH-LEGGED HAWK.

Mr. Atkinson in his "Rare Bird Records" (*Trans. No.* 65 *Historical and Scientific Soc. of Man.*) gives a single record of this species as being the only one known from the province. As a matter of fact the bird is by no means uncommon, and, judging from old nests, it has evidently resided in Manitoba for many years past. Its haunts are very similar to those of the Red-tailed and Swainson's hawks, excepting that it has not been observed to spread over the open prairies as the last named species does. The nests are nearly always distinguishable from other buzzards by their bulkiness, due to the fact that they are added to year after year until eventually they become so abnormally large that they break through their supports or are blown down by the wind. All my nesting records of this hawk were made within, or near, the Spruce Woods Timber Reserve, which is largely made up of low sand hills forming ridges with semi-wooded valleys between.

The Ferruginous Rough-leg is probably the most useful of all our buzzards, its food being made up almost entirely of rodents, of which by far the greater proportion consist of gophers. I have repeatedly seen it carrying off those animals and have found nests inhabited by young containing several untouched examples. It is almost certain that these hawks destroy far more than they can consume when food is abundant, and for this reason a family of these birds might well be estimated to account for a thousand gophers in the course of a season, which, supposing these latter to have been taken from a grain field, would be equal to a saving of five hundred bushels of grain.

This hawk should be better known among the farming community and as a step in that direction I would propose that we discard the cumbersome name that is at present attached to it and call it Rusty Hawk instead.

BURROWING OWL.

This owl has previously been recorded by Mr. Atkinson in the above mentioned publication, and by me in the *Ottawa Naturalist*. It has always been considered a rarity, however, and for that reason additional records of the bird's occurrence are desirable.

During the last three years I have had occasion to travel rather extensively over the western portion of the province, and as a result have run across several breeding pairs of this species. No less than three families were observed near Souris, another was noted near Melita, while odd individuals were seen at Pierson, Napinka and Virden. I have usually found this owl in the vicinity of badger holes with burrows of the prairie gopher (*C. richardsoni*) close around. It probably nests in the former excavations and doubtless uses the gophers as food.

ARKANSAS KINGBIRD.

Whether this bird was overlooked in former days or has extended its range northward within recent times is a question I am not prepared to answer, but it is now found quite commonly in the south-west portion of the province, where it shows a marked preference for human habitations. Nearly every village now has its pair of breeding birds, and the larger places often contain three or four. Trees around the farm yards are also frequently utilized, and the somewhat quarrelsome notes of the bird are among the first to attract one in the early morning. I have observed this species breeding near Winnipeg, and from there westward, along the C.P.R. main line at Carberry, Oaklake and Virden. It is most commonly met with, however, in the south-west portion of the province within a line drawn from Mawbray to Kirkella.

BLACK-HEADED GROSBEAK.

On the 30th of May, 1919, I was busy in the laboratory with insect work but with ears on the alert for the notes of any newly arriving bird. The work was interesting, and for that reason I had been but half conscious of an unusual song uttered rather continuously from some nearby trees. I had passed it as being an attempt of a Catbird to mimic the combined efforts of a Rose-breasted Grosbeak and House Sparrow, but eventually awakening to the improbability of this I decided upon a closer investigation and easily obtained a close view of the songster which was perched upon an oak. There could be no mistake under such close scrutiny. A heavy beak, the bright brown of a Towhee, white on the wings and tail and a black head. All were plainly visible. Knowing, however, that a dead bird is demanded by exact science I hesitated whether to go for a gun, but what is a dead bird in comparison with a living one which gives promise of breeding where its kind have not previously been known? To me the evidence was complete, but for the sake of corroboration, I called my brothers Stuart and Talbot to view and note the more striking features, which they did, while the bird sang on unconcernedly.

I had hoped that this visitor would have a mate and that they would make their home amid the woods close by, but he vanished the same evening and I saw and heard him no more.

The cause of this bird's having moved beyond its usual range may have been due to abnormally warm weather combined with a succession of south winds. On the other hand, it is possible that the species really does breed in the extreme southern portion of the province as the song, though

quite distinct, might easily pass as an abnormal one of a Rose-breasted Grosbeak.

DICKCISSEL.

This bird was first recorded for the province by Mr. G. E. Atkinson, who took a specimen near Portage la Prairie on June 14, 1897. He concluded that the example was a straggler from the south, though the date at which it was taken would indicate that it was breeding in the neighborhood.

On June 24, 1921, I was out on grasshopper work in company with Mr. P. N. Vroom. We stopped at Melita and had gone out in the evening to do a little collecting south-west of the village. About half a mile away there is a ravine with stagnant pools of water, and just beyond, to the right, a rather wide dry meadow dotted over with low-lying shrubs consisting of Silverberry (*Elaeagnus argentea*), Western Snowberry (*Symphorocarpus occidentalis*) and a few others in lesser numbers. There is some high herbage, too, which provides abundance of cover for small birds. It was on the edge of this meadow, near the road, that I heard a song with which I was unfamiliar and which I traced to a small bird sitting upon a fence post. We soon obtained a close view of the singer, which I recognized by the characteristic black patch beneath the throat to be a Dickcissel. This was a male in full song and, interestingly enough, his song was answered by a second individual about 80 yards away in the same valley. No nests were found or even sought for, but from the fact that there were two or more males singing there, I think we may safely conclude that the species breeds in the vicinity.

LARK BUNTING.

This species ranges east to Aweme, where it has been known to nest. It is, however, but a casual visitor in most parts of the province, though it breeds quite commonly in the extreme south-west corner.

BLACK-THROATED BLUE WARBLER.

Two examples, both males, have been seen since my original record of this species. While these birds were not collected the markings are so distinctive that it would be an extraordinary lack of observation to mistake the species for any other.

MOUNTAIN BLUEBIRD.

It is interesting to relate that this handsome species has taken readily to nesting boxes and that it is steadily increasing. Both this and the common Bluebird have made their nests in the vicinity of my home for some years past, and while the House Sparrow is there, too, and has a reputation for fighting, he is invariably vanquished when he comes in contact with the Bluebirds.

LESSONS LEARNED FROM A TAME SPARROW HAWK.

By P. A. TAVERNER.

(Published by permission of the Director of the Victoria Memorial Museum.)

Some years ago we kept what I was about to call a captive Sparrow Hawk; but the word "captive" conveys an erroneous impression of relationship. "Tame" is weak and equally misleading. Perhaps it is better to make a new start and state that, — once upon a time, I was on intimately friendly terms with a Sparrow Hawk. She had been taken from her deep, dark nest cavity a half downy youngster, inexperienced in the ways of Sparrow Hawks in the wide, wild world; and whatever she afterwards did or thought or attained was more the result of instinct and natural ability developed through contact with human kind, than of normal Sparrow Hawk education. When I first met her, an adolescent bird, as friend and master, there is reason to suspect that experience with humans had not predisposed her in their favor; but, as events proved, nothing serious enough had happened to prevent the establishment of thorough confidence between us. During the two or three years this charming intimacy endured I had unusual opportunities for studying Sparrow Hawk nature in general and this bird in particular.

Ornithological observers are familiar



FALCO, a tame sparrow-hawk (falco sparverius).

with the fact that all wild creatures have certain fixed specific habits and mental reactions to various stimuli. Some species are particularly wary and cautious, others are constitutionally confiding or bold. What we also know but usually realize all too vaguely is that besides these characteristics common to a species, are other mental attitudes that are as strictly individual as many human traits. In watching Falco, as we called her, it was borne in upon us with all the force of a strictly new discovery that the Sparrow Hawks we thought we knew so well are not automata all cast in the same mould, that they each have mentalities of their own, personal habits that change in detail from time to time under whim or passing states of mind, individual likes and dislikes; in fact they have lives of their own to live and minds of their own to live them. Even a field naturalist is apt to acquire the habit of considering the birds he studies in the broad and general, as species and subspecies rather than as individuals. Not the least learned from association with this little hawk was this appreciation of her individual personality.

Next to these evidences of personality the most striking qualities Falco presented were affection, and, if the manner of dealing with unusual conditions is a criterion, her quite considerable intelligence. Though suspicious of strangers, she showed a decided liking for her immediate family, and enjoyed to sit upon our shoulders, fluffed up like a ball cuddling close to the neck and passing her bill delicately around the convolutions of the ear to the accompaniment of a contented little churring note of satisfaction. She knew even the sound of our foot-steps. A stranger's footfall along the concrete sidewalk leading to the outer door drove her precipitately to her safe citadel on top of her seldom occupied cage in the far upper corner of the room. The sounds of our steps on the same walk merely caused a look of expectation and a preparation to alight upon our shoulders as soon as we appeared. She recognized paper parcels as common containers of meat and showed interest in them accordingly. She knew that water could be obtained at the sink through our mediation, and came to it when thirsty or wanting a bath. She recognized doors as the means of communication between rooms and when lonely and wanting to join us, came to them and scratched and churred for admission. A mirror perplexed her once but, finding nothing behind, she had no interest in it afterwards.

At times she was playful and enjoyed a certain game in which a long yellow pencil (no other color served quite as well) was pointed at her. On finally gaining possession of it she would brandish it most cleverly with feet and bill until it slipped to the floor, when she would look down, as if in surprise, and descend to obtain it again. She had many mimic fights with her distorted reflection in the curved base of a brass lamp, would hide from it behind books or obstructions, then pounce from ambush, striking vigorously with her feet and uttering low churs of pleasure.

Though nervous with strangers, especially men, she showed a surprising lack of appreciation of danger from hereditary or natural enemies, showing that fear of definite objects is not as instinctive as is commonly believed. A strange face at the window caused her to flee in terror, but I have seen her sit with only interested curiosity on the window sill within, whilst without a cat struggled to make through the glass at her. A dog was only an interesting phenomenon to her, nothing more.

Once a cigar box, with a hole in the side like a bird box, was prepared and hung near her usual perch. She was interested at once, and hardly was it fixed than she was peering in. She entered, and for the next little while nothing was seen of her except occasional glimpses of her bright little face looking out, but from within could be heard the sounds of scratching, thumping and excited ejaculation. Thereafter she spent many minutes, aggregating hours perhaps per day, in the box, always in an excited condition. It was evident that latent sexual instincts were aroused, and feeling half guilty at having raised unsatisfiable desires we removed the box.

In spite of the unnaturalness of the circumstances surrounding her she appeared content and happy, except for short

periods twice a year — early spring and late fall. In the spring, before the sap had stirred on the sunniest slopes, and whilst snow seemed the eternal order of things, and the season's advance was only to be noted by the calendar, she became restless and discontented. It was the "Season of New Song"; more, it was also, it seemed, the season of migration, and whether she knew the meaning of it or not something stirred within her in consequence and she was deeply moved. Normally serene and contented in her window, watching with bright, interested eyes all that passed within her ken, then she was restless and excited, pattering back and forth along the narrow runway of her window meeting-rail, pausing at intervals to half-raise her wings and chatter loudly the well-known Sparrow Hawk cry of agitation. Once at such a time I saw a wild Sparrow Hawk pass over without She saw it too, for little escaped her piercing eyes. She followed it with her gaze from the time it first hove in sight, leaning against the glass to see around the window jamb until it passed from sight behind some trees. This condition lasted but a little while each season, a couple of weeks perhaps, but while it lasted it was nearly as hard on us, her friends, as upon herself. Shortly she was her old self again, content to watch the world go by from her observatory window, her only agitation the butcher's or grocer's boy that brought her food and sent her seeking safety to the high top of her empty cage. Similar disturbances to the even tenor of her way occurred in the fall. As the first frosts loosed the leaves and the grasshoppers were dropping numbed from the yellowing grass whence wild Sparrow Hawks had but lately gleaned them, nature stirred again within her. Its meaning I do not think she ever definitely recognized, but she became again uneasy, restless and difficult to please.

Now, neither before nor during these periods were there any perceptible changes in the conditions under which she lived. She was not reactive to differences or shortage of food, temperature or any other factor that could be humanly recognized. The change came from within, rather than from without. I think that as fruit and foliage grow through the season, in certain times ripen to maturity and then decline in metabolic activity, so the migrating and sexual instincts develop, culminate and decline in measured growth but slightly accelerated or retarded by variations in seasonal condition. And thus birds feel the urge to migrate, and depart in the fall before the lack of food, the ultimate necessity for such a movement, has sapped their energies and vigor. In the spring it works the other way; the onward urge toward a harder rather than a softer climate comes early, and they tread upon the very footsteps of winter, arriving north at the earliest moment that existence for their kind is measureably secure, to the end that they have the greatest length of season in which to raise their families to migrational maturity before the return of winter.

One of Falco's interesting physical characteristics was her comparative independence of water. She was fed principally on butcher's meat. When liver, English Sparrows or other moist meat formed a fair proportion of her food, water was only desired for bathing, and sometimes weeks went by without her drinking. After a spell of rather dry meat she desired water and asked for it in a way that we who knew her little idiosyncracies recognized perfectly. She enjoyed bathing, and splashed the water from her bowl far and wide, retiring afterwards to her sunny window to dry and fluff. As said before, her food was largely, and of necessity, from the butcher's shop, and when English Sparrows grew too wary to be readily obtained, it was found necessary occasionally to mix a little chopped tow or shredded rope end with it to supply the roughage for natural digestion and the pellet for regurgitation. She invariably avoided fat, tearing it from the lean in little shreds and impatiently discarding it. She also appreciated a variety in diet, and changes from beef to pork or mutton or back again always met with her approval. At times she even tired of English Sparrows and became satiated with her favorite tit-bits, June-bugs or Grasshoppers. It is evident then that birds enjoy a variety of foods, and no matter how plentiful some one supply may become, at times they will turn their attention elsewhere to balance

out the ration. This trait undoubtedly extends the usefulness of each species of birds and at the same time explains why, in time of great insect plagues, birds are not engaged in eating them to the exclusion of less abundant food. Some variety is desirable if not an absolute necessity to them.

The quickness of some of Falco's reactions were remarkable. An extreme example can be presented. She slept on the top of her cage, canary-like, with her head under her wing as it is generally described, although really the head is hidden under the interscapular feathers between the shoulders.

Wishing to obtain a photograph of her in this attitude a camera was set conveniently, and late at night, when she was sound asleep, an explosive magnesium flash was fired. Of course she awoke immediately, but the speed of her movement was only appreciated when the resultant negative was developed. It presented two clear superimposed images without blur between. One showed her asleep with only a slight depression in the feather masses where the head was hidden; in the other she was wide awake regarding the light. What the duration of the flash was I had no means of telling; it was surely but a small fraction of a second, yet during this short period she had held her pose long enough to make a sensible impression on the plate. She had awakened, changed her position so quickly that the movement made no blur, and again held her position long enough to register another picture.

Falco had the habit of "caching" superfluous food. She did this from the first, and in so business-like and natural a manner that I am convinced that it was instinctive and is a regular specific habit. I have seen no suggestion to this in the literature relating to the wild bird. This case may not prove beyond question that wild Sparrow Hawks do hide stores, but it is strongly suggestive of its probability When hunger was temporarily satisfied, the unconsumed remainder of the supplies was invariably carried in the bill to one of several usual hiding places. The most favored one was on top of the electric meter on the wall nearby. She would place the valued bit in the depression between the top of the meter and the wall, and stamp it down with her feet in a business-like manner, churring with a note of exultation and then withdrawing to view results. If not satisfied she would return and rearrange and hammer it again and when satisfied seek her perch Any time thereafter a motion on our part towards her store would arouse anxious interest, and if the threatened theft were pressed she was immediately on hand to protect her property. Even if the attempt



a. — Normal falcon bill.
b. — Overgrown falcon bill, showing tendency of growth and loosening scale.
c. — Normal Buteo bill.

did not seem serious, after a minute she often made an investigation and 'even changed the hiding place. When hungry again she remembered her hidden store and, if it had been removed unbeknown to her, showed disappointment and perplexity most plainly.

Perhaps from a strictly scientific standpoint the most interesting discovery made from this little bird was the method of growth of her bill. The Sparrow Hawk, though small, is a true Falcon, a "Noble Falcon" in the old vocabulary of venery The bill of this group of raptores is distinguished from the less esteemed hawks by having a distinct notch and tooth on the cutting edge of the upper mandible just back of the hook. This tooth therefore is an important point in the classification of the order. Falco lived largely on soft meat, and her bill without the natural friction and wear and tear against the hard bony parts of normal prey overgrew. When this occured the notch forming the tooth became almost obliterated, and the bill tended to resemble the form and character of the non-falconine hawks with a smoothly outlined lobe on the cutting edge. When this abnormal condition became well developed, and it seemed as if a falcon was about to assume a Buteo or Accipiter character, a crack

developed in the bill substance and grew until a flake of horn flew off, leaving the falconian notch fully developed again

The significance of this is rather important as it indicates that the tooth-billed hawks are more highly developed than the others and appeared later in the evolutionary scheme; that the "Noble" is a specialized "Ignoble Hawk" instead of the contrary. It is, in fact, additional justification for contemporary classifications placing the Falcons at the head of their order.

Falco had a considerable measure of freedom, and seldom except for good reason was confined to her cage. When the robins without would leave her in peace and some one was about to ward off cats she even had the run of the yard. Had she allowed her primaries to mature she might have had absolute freedom at any time. She always managed to break them off before full grown and was in a half flightless condition unequipped to fend for herself. Season after season passed in various attempts on our part to keep her wings in order, to prepare her for a fair fight with the world. Whether we succeeded in the end we do not know, but that is another story.

All told, little Falco was a most pleasing experience in the life of an ornithologist and we still remember her with affection, regretting that such happy associations cannot continue indefinitely.

NOTES AND OBSERVATIONS.

UNUSUAL MIGRATION RECORDS IN THE VICINITY OF MONTREAL. — MARCH 1921.

No doubt the mild weather during the past winter, and the abundance of fruit and seeds (especially coniferous seeds) limited the movements of a great many Northern birds. Throughout South-Eastern Canada and the North-Eastern States, at least in urban districts, the dearth of birds appears to have been general. Of the customary winter birds the following were seen in the vicinity of Montreal in very small numbers: Snow Owl (2); Saw-whet Owl (2); Hairy and Downy Woodpeckers; Snow Bunting; White-winged Crossbill; Pine Siskin; Goldfinch; Redpoll; Cedar Waxwing; White-breasted Nuthatch; Red-breasted Nuthatch; Black-capped Chickadee.

The unusual occurrences were: Herring Gull (last seen Jan. 15); Canada Goose (Magog, Jan. 16—N. Smith); and Robin (4) seen by Mr. Brown on Jan. 30. There were several other reports of Robins that I was unable to verify — one from St. Lambert, another from Westmount and a third from St. Andrews East. It is notable that the only unusual birds were north of their usual winter range. I have no records of Evening Grosbeaks, Bohemian Waxwings or Pine Grosbeaks. With regard to the latter I am told that they have wintered commonly in Newfoundland.

During January and February I saw no ducks whatever, possibly due to the many areas of open water. As a rule, in the vicinity of St. Lambert, wintering ducks are congested within a small area of open water, and are easily seen. Following is a list of spring arrivals during the month of March. The earlier birds — Crow and Prairie Horned Lark, were late, while the others, almost without exception, were very early. I have taken the liberty of including several records secured by Mr. W. J. Brown, and one by Miss E. Luke.

March 2—Crow.

March 4—Prairie Horned Lark.

March 5—Flock (15) of Robins on a sheltered southern slope, two Meadowlarks and a Red-shouldered Hawk, all seen by Mr. Brown.

March 9—Song Sparrow (39 'song').

March 11—Red-winged Blackbird (35 males, 'song'); House Wren—one seen in a sheltered garden by Mr. Brown.

March 12—Bronzed Grackle — 6 seen (Mr. Brown); Bluebird — three 'song'.

March 13—Marsh Hawk — one; Robins and Song Sparrows fairly common.

March 1 —Slate-coloured Junco — one (Miss Luke).

March 19—Canada Goose — one flock; Purple Finch—7 (Mr. Brown).

March 20—Northern Shrike — one; Herring Gull — one.

March 22—Golden-eye Duck—two flocks.

March 25—Black Duck — three pairs; Bittern — one; Sparrow Hawk — one; Flicker — one; Goldfinch — 5 or 6; Tree Sparrow —a number; Killdeer Plover— 7 seen and two nest excavations found; Bluebirds fairly well distributed — 8 seen; a Crow's nest was found almost completed, and Robins were found exceptionally abundant.

March 26—Rose-breasted Grosbeak — one male (Mr. Brown); Cowbird — one.

March 27—Goshawk—one; Migrant Shrike — two; Vesper Sparrow — one (Mr. Brown).

Besides the unusual records enumerated above there are two matters worthy of particular mention — the unusual abundance of Robins and Black Ducks. I assume that Black Ducks are unusually abundant this season because I saw three pairs about some marshy, partly wooded land, where formerly it was customary for but one pair to nest. It is an easy matter to distinguish ducks that have arrived on their nesting grounds. They are always in pairs and the drake appears never to let his spouse out of sight, or perhaps it is the other way about. The individuals of a pair fly in perfect 'step' and appear as a unit.

Possibly the consistently favourable weather during the nesting season last spring is partly responsible for this apparent increase, and very probably the vigilance of officers in enforcing observance of the Migratory Birds Convention Act has much to do with it.

L. McI. TERRILL.

A PINE SISKIN INVASION. — In Central Alberta, the Pine Siskin (*Spinus pinus*) has generally been considered an irregular migrant, except in a few favorable localities where they remain to breed in small numbers. As they are frequenters of the coniferous woods, especially during the nesting season, these birds are not commonly seen in the settled parts of the country, the spruce, tamarack and jack pine not growing on the better soils of the prairie.

Abourt the middle of June, this year, I noticed numbers of siskins flying over Camrose, and eventually found them feeding on dandalion seeds on the lawns and boulevards. Their numbers increased daily, and about a week after their first appearance I estimated that at least five hundred of the birds were making their home in town. At almost any hour during the day, large flocks could be seen flying high in the air, whirling here and there, in Red Poll fashion, sometimes alighting on a vacant lot, feeding for a while, and off again as suddenly as they came. I have counted as many as one hundred on the telephone wires between two poles, which appeared to be favorite resting places for the birds.

The siskins' appearance this summer was not local by any means. During the months of June, July and August, I motored several hundred miles, and found them quite common in some, and exceedingly common in many of the places through which I passed. They were plentiful in Edmonton, noticed all the way to Calgary, and not nearly as many at Banff and Lake Louise, where one would expect to find them in greatest abundance. This makes one ask if it is not possible that they had left their natural haunts for some reason. I also found them very common at Vermilion, Tofield, Stettler and Castor. At this date, September 15th, there are about one thousand birds in Camrose, and they are now feeding on the pig-weed seed.

As all the points mentioned above (except those in the mountains) are in the park country of the prairie, where there are no evergreens, save small patches along the river bottoms, it seems strange that these birds should have made this unusual migration. As the siskin is an early breeder, nesting in May, it is safe to assume that the birds that have been on the prairies since the middle of June were old ones and the increase of the year. It would be interesting to know if this unusual appearance of the siskin has occurred over the whole prairie country and the reason for this decided change in habitat.

F. L. FARLEY, Camrose, Alberta.

SOME MOSSES FROM BOSKUNG.

As botanical field work in Canada at the present day is largely confined to flowering plants, a few amateur notes on Ontario mosses may perhaps be forgiven by the small omniscient experts to whom my findings must seem elementary and superficial.

In the month of August, 1921, I spent a two weeks vacation on the shores of Boskung Lake, Stanhope township, Haliburton county, Ontario. By way of diversion, I attempted to take a census of the mosses of the immediate neighborhood. The completed census-roll, though limited, may not be without interest.

Boskung Lake is a small, pear-shaped body of water, lying wholly within the rough, granitic Laurentian Pene-plain. Its surface is some 1100 feet above sea-level and its shores rise steeply to an additional height of from 100 to 150 feet. Its narrow watershed contains no bogs, swamps, or small streams. The soil is morainic sand.

The possibilities of the field were thus distinctly limited, and the various mosses which favor limestones, which grow at low levels and in warm climates, and which flourish in bogs, in water, or on clay soil, conspicuously lacking. With these reservations, however, my brief survey found many species and much encouragement.

The chief soil-loving mosses were the Common Hair-cap, the glaucous-green Juniper Hair-cap, the muddy-green Common Barbula, the Common Bryum, the Crested Fissidens, and the Maidenhair-like Fissidens.

Frequent finds in moist woods were the Common Fern Moss, the Smaller Fern Moss, and the Woodsy Mnium. The Clavellate Drummondia was common on the bark of trees; while the Slender Plagiothecium and the Adnate Amblystegium were found about their bases. Rotten wood was upholstered with dense mats of the bright green Common Hypnum, the Pinnate Hypnum, the slender Creeping Amblystegium, the Creeping Hypnum, the Nodding Bryum, and the Ribbed Hypnum. Around old stumps I found the European Tree Moss, not unlike a small Lycopod, and the dark, thin mats of the Purple Ceratodon.

At the head of Boskung Lake, Hall's Rapids, a short but violent stream foams down from a higher lake to the north, drenching its rocky ravine with spray. Here were soft, wet masses of the Beaked Anomodon, the Slender Anomodon, the Bristly Rhacomitrium, the Long-Leaved Mnium, the Fountain Philonotis, and the Verdant Weissia.

A final hunting-ground was a steep granite cliff, caused by a colossal fault in the rocks around the entire northeast shore of the lake and kept moist at its base by a thick mantle of forest. Small, dark tufts of Common Grimmia were the first discovery; then came the dark, brittle masses of the Rock-loving Andreaea, the flattened branches of the Filmy-fern Homalia, and the delicate little Wiry Fern Moss; and then the Yew-leaved Fissidens, the Small-capsuled Rhacomitrium, the Long-capsuled Brachythecium, and the Crispate Ptychomitrium.

Some 34 different species of moss were thus identified, with more or less dubious accuracy. Several other specimens were collected, but for them identification was impossible with the two hand-lenses, of 9 and 24 diameters respectively, with which I was equipped.

The record is a small one, but surely large enough, when we consider the limitations of time, season, and physiography in this individual case, to suggest real possibilities for amateur bryological work in Ontario.

WATSON KIRKCONNELL, M. A.

BIRDS AS FOSTER PARENTS. — It is not generally known, probably, that wild birds will assume the role of foster parents, but after a number of tests the writer has discovered that there are a few birds at least that will take up these duties under certain conditions. Firstly the orphan birds must be quite young, and, secondly, the foster parents must have young of their own about the same age. I have exchanged the young of crows, pigeons, swallows and sparrows, and in every instance they were raised to maturity. This was done when the young were in the downy stage and all were about the same age, but if a more mature bird be introduced into a nest of downy

young he would be promptly ejected or left to starve. It seems that the maternal and paternal love of birds is the strongest at this period, which might account for their taking more readily to the young of others. While the fostering of the above-mentioned species was in the main brought about through human agency and not on their own volition, yet it has been my good fortune to observe a few cases of strictly voluntary adoption.

One of the most interesting cases of this kind was that of a pair of Killdeer Plover. In the spring of 1919 a young man brought to my shop a pair of these birds to have mounted with their young ones which he had caught after shooting their parents. As these birds had been shot at close range while protecting their young, they were too much cut up for mounting, so I prevailed on the young man to give me the young orphans to release, which he did. It seemed to me that perhaps I could get them adopted by a pair of Killdeers which I knew had young, and occupied a field about half a mile distant. With this end in view, I forthwith picked up the box of little orphans and made a bee-line for that field, but after criss-crossing the field several times, I failed to locate them and was becoming discouraged. I then walked to the centre of the field, sat on a stone and took the perforated cover off the box. They stretched up their little necks and gave utterance in unison to a very low plaintive cry or pipe. Almost immediately, like a bolt from the clear sky, the female Killdeer flew towards me and settled about 25 yards distant. She had heard their piping cry and came to rescue. She appeared to be in great distress and anxiety. When the little ones heard her voice they also became agitated and raised their little voices, which brought the mother bird almost to my feet uttering most bewailing lamentations. Then I took one of the little orphans from the box and set it on my hand. The scene which followed was very pathetic. She seemed to go into paroxysms of grief, and with most lamentable cries and wings and tail outspread, quite fearless of me, she ran around me at a distance of not more than 15 or 20 feet. She would drag herself on her breast as though both her legs were broken, then roll over on her back struggling as though she was tied down; hop along on one leg with wings drooping; turn summersaults and put herself into all manner of shapes. Obviously these manoeuvres were to entice me to chase her and get me away from the young ones.

Not caring to keep her in further suspense I set the little fellow down, and he ran over to her as fast as his little legs could carry him. She advanced a little to meet him throwing one wing over him, and uttering a most affectionate purring or crooning sound of joy and satisfaction, something akin to that of a mother cat when you take her kitten from her to fondle. I now released the other three and they likewise made direct for this foster mother, and she slowly led them away until I lost sight of them in the grass. Had they been her own, and she must have known they were not, she could not have shown more maternal love and affection. The male bird the while kept up his plaintive pee-we-we-we-we-we-we-we, but did not come so close, and I feel certain kept his eye on their own litle flock. I am satisfied that these foster parents raised these little orphans, as, passing through the field again in August I counted nine on the wing, and I am absolutely certain that these were the only pair of Killdeer that nested in that field or vicinity that year.

OLIVER TRAFFORD,
St. Eugene, Ont.

WHITE-RUMPED SANDPIPER AT OTTAWA. — Two white-rumped sandpipers (*Pisobia fuscicollis*) were noted at Shirley's Bay, near Ottawa, on October 8, 1921. They were in company with some black-bellied plovers and solitary and other sandpipers, and the difference between the white-rumped species and the others was quite plain as a result of the conspicuous white upper tail coverts. A specimen was collected to make identification certain. The only available authority stated that this bird has only been noted on three occasions in this locality.

PHILIP F. FORAN.



The Canadian Field-Naturalist

INDEX

Volume XXXVI



INDEX TO VOLUME XXXVI

PAGE

Abies lasiocarpa 114
Acanthis linaria 164
linaria linaria 13
Accipiter velox ..63, 133, 147, 162
Achillea millefolium 61
Acmæa geometrica 123
Acrididæ 41, 42
Acridinæ 42
Acridium 42
Acridotheres cristatellus ...32, 54
Acrydiidæ 41, 43
Actitis macularia 45, 63, 105, 162
Adams, J., article by 177
Adamstone, F. B., article by 129
Additional Notes on the Winter Birds of the Okanagan Valley, British Columbia 12
Adula stylina 121
Adventures with the Canada Goose 81
Aechmophorus occidentalis 103
Aegialitis semipalmata 45, 63, 105
Aethiospar cristatellus 54
Agelaius phoeniceus 64
phoeniceus caurinus .. 30
phoeniceus phoeniceus. 147
Aglais j-album 141
milberti 141
Albertson, Alice O., Review of her "Nantucket Wild Flowers" 40
Alces americanus 65
Alder 170
Allen, E. Chesley, articles by 106, 126
American Association for the Advancement of .. Science, Resolution by 51
American Hawk Owl, The 68
Amnicola 132
Amygdalocystites 85
Anas platyrhynchos ..50, 62, 104
Ancylus 133
Anemone, Prairie 61
Anemone patens wolfgangiana 61
Anodonta 132
Anser albifrons gambeli ... 62
Antelope 158
Anthus rubescens 65, 166
Antrostomus vociferus vociferus 147
Ants 127
Aphriza virgata 105
Aplodontia rufa 30
Arbutus 3, 169
Arbutus menziesi 3, 21
Archaeocrinus 85
Archilochus colubris 45, 147
Arctic, The 142
Arctomys monex 34
Arcyria incarnata 130
nutans 130

PAGE

Ardea herodias 45, 59, 162
herodias fannini 105
herodias herodias 147
Arenaria interpres morinella 105
melanocephala 133
Arethusa 173
bulbosa 173
Argynnis aphrodite 141
atlantis 141
cybele 141
Artemisia 90
Asclepias syriaca 142
Asellus communis 156
tomalensis 156
Asplenium Ruta-muraria 150
Trichomanes ..149, 150, 151
viride 61, 150
Astragalinus tristis 164
tristis tristis 46, 148
Astrocystites 85
Astur atricapillus 63, 133
Asyndesmus lewisi 13
Atelocystites 85
Athyrium angustifolium ... 150
Auk, Great 140
Razor-billed 20, 155
"Auk, The", review of 76
Auklet, Rhinoceros 104
Cassin's 104
Avocet 90, 91
Azure, Spring 141

Bacteria 78
Badger 67
Badhamia decipiens 130
foliccola 130
panicea 130
utricularis 130
Baldpate 62, 79, 90
Baltimore, The 141
Bancroft, Merle F., article by 87
Basilarchia archippus 142
Bat 103, 126
Bear, Black 65
Grizzly 87
Polar 65
Queen Charlotte Black 103
Beard Tongue 124
Beaupre, E., article by ... 33
Beaver, Canadian 65
Mountain 30
Bedstraw, Northern 61
Bee, Humble 169
Bee-fly 66
Beetles, Blister 66
Bent, Arthur Cleveland, review of his "Life Histories of North American Diving Birds," and "Life Histories of North American Gulls and Terns" 18

PAGE

Biological Notes along 1400 miles of the Mackenzie River System. 61
Biological Reconnaisance of Portions of Nipissing and Timiskaming Districts, Northern Ontario 175
Bird Notes from the District of Algoma, Ontario 153
Bird Sanctuaries on the North Shore of the Gulf of St. Lawrence. 154
Birds in Southwestern Saskatchewan, Notes on 94
Birds of a Suburban Garden 146
Birds of North Bay, Ontario, and Vicinity in 1904 161
Bison, Wood 65
Bison bison athabascæ 65
Bittern 27
American ...62, 74, 76, 162
Blackbird, Brewer's..13, 74, 138
Red-winged 27, 64, 74, 138, 147, 175
Rusty 13, 46, 64, 147
Yellow-headed 27, 29
Bladderwort 123
Flatleaved 124
Horned 124
Humped 125
Larger 123
Lesser 124
Purple 125
Reversed 124
Bladderworts of Ontario .. 123
Bleeding-heart 60, 156
Blood Root 108, 110
Blue, Eastern-tailed 141
Blue Bell, Scottish 61
Bluebird, Eastern ..71, 149, 154
Mountain 35, 37, 65, 75
Western 13
Boag, Mrs. E. J., article by 113
Bobolink 45, 147
Bob-White 91
Bombycilla cedrorum 13, 46, 148, 165
garrula 148
Bonasa umbellus 63
umbellus togata 45, 147
Botany 168
Botaurus lentiginosus 62, 162
Botrychium lanceolatum var *angustisegmentum* 149, 151
Brachyramphus marmoratus 104
Bradshaw, F., article by .. 91
Branchinecta paludosa 96
Brant 144, 180
Black 145

INDEX—*Continued*

PAGE

Branta bernicla 144
bernicla bernicla 144
bernicla collaris 144
bernicla glaucogastra . . 144
canadensis 62, 81, 104
canadensis canadensis. 12, 147
canadensis hutchinsi . . 50
glaucogaster 144
Bryozoa 84
Bubo virginianus virginianus 45
Buccinum undatum 157
Buffalo 118, 158
Buffalo Berry 61
Bufflehead 62, 73, 74
Bug, Ambush 60
Bumble-bee 60, 156
Bunting, Indigo 148, 165
Lark 177
Snow 14, 164
Buteo borealis 63
borealis calurus 134
platypterus 45, 162
Butterflies 126, 141
black and white admiral 127
Butterfly, Common Blue . . 108
Hepatica 108
Hunter's 141
Thistle 108
Butterwort 61, 124

Caddis larva 127
Calidris leucophaea 105
Calopogon 124, 173
pulchellus 173
Calypso 173
Camberwell Beauty 108
Camnula 42
Campanula 61
rotundifolia 61, 150
Camptosorus rhizophyllus . . 150
Canachites canadensis 63
franklini 63
Canadian wild life photographs, exhibition of 179
Cannabis sativa 177
Canvasback 62
Carabocrinus 85
Cardinal 14
Caribou 158
Dawson 103
Carpodacus cassini 13
purpureus 164
purpureus purpureus 46, 148
Carter, Thomas D., article by 176
Carterocephalus palaemon . . 142
Carychium exile 132
Cascara 169
Sagrada 3
Cassels, Elsie, article by . . 58
Cassiope tetragona 157
Castilleja 61
Castor canadensis 65

PAGE

Catbird 149
Cathartes aura septentrionalis 178
Catoptrophorus semipalmatus semipalmatus . . 152
Cattle, Wild 103
Cecidomyia 171
Cedar, Yellow 114
Cephalanthera oregana 119
Cepphus columba 104
grylle 45, 98
Ceratiomyxa fruticulosa . . . 130
Cerithidea newcombei 123
Cerorhinca monocerata 104
Certhia familiaris 167
familiaris americana . 46, 149
familiaris montana . . . 13
familiaris occidentalis . 136
familiaris zelotes 13
Ceryle alcyon . . . 45, 63, 134, 162
Cestod 160
Chaetetes petropolitanus . . . 84
ramosus 84
Chaetura pelagica 45, 147
Chamaecyparis nootkatensis 114
Charadrius dominicus 63
dominicus fulvus 105
Charitonetta albeola 62
Check List of The Birds of Illinois, Review of . . . 179
Checker-spot, Harris' 141
Cheirocrinus 86
anatiformis 84
Chen hyperborea 62
hyperboreus nivalis . . . 50
Chickadee . . 14, 46, 78, 149, 154
Acadian 46
Black-capped 153, 167
Chestnut-backed . . . 13, 136
Hudsonian 65
Long-tailed 75
Chipmunk 119, 127, 175
Lake Superior 175
Choke Cherries 3
Chordeiles virginianus . . . 64, 163
virginianus virginianus 147
Cinquefoil, Three-toothed . 150
Cinqfoil, Shrubby 61
Circinaria concava 132
Circus hudsonius 63, 162
Citellus 119
Cladoceran 156
Clangula clangula americana 62
Cleiocrinus 85
Cliff-Brake, Slender 151
Clitambonites 85, 86
Clover, Red 169
Club, A New 58
Coccyzus americanus americanus 147
erythrophthalmus 147
Cochlicopa lubrica 132
Cockerell, Prof. T. D. A., review of his Life of Dru Drury 75

PAGE

Colaptes auratus 63, 163
auratus luteus 45, 147
cafer saturatior 134
Columba fasciata 133
Colymbus grisegena 76
holboellii 27, 62, 76, 103
Comarocystites punctatus . . 84, 85
shumardi 85
Comatricha typhoides 130
Comma 108
Compsothlypis americana . . 166
americana usneae . . . 46, 148
Conchostraca 95
Condor, The, Review of for 1921 52
Coneheads 41
Contributions to Canadian Biology, review of . . . 158
Coot 27, 114, 115
American 29, 74
Coots, An Invasion of 114
Copper, Bronze 141
Least 141
Corallorhiza maculata 173
trifida 174
Coregonus 65
Cormorant, Double-crested 45, 73, 74, 80
Violet-green 104
Cornus nuttalli 3
Cornwall, Ira E., article by 121
Corus brachyrhynchos 164
brachyrhynchos brachyrhynchos 45, 99, 147
caurinus 135
corax 164
corax principalis . . 45, 50, 64
corax sinuatus 135
Corydalis, Pale 150
Corydalis sempervirens 150
Cowbird 74, 98, 147, 164
Crab, Hermit 157
Crane 62, 105
Little Brown . . . 53, 76, 79
Sandhill 53, 76, 79
Whooping 50
Craterium leucocephlalum . . 130
Creeper, Brown 14, 46, 136, 149, 167
Rocky Mountain 13
Sierra 13
Cremacrinus 85
Cricket, Fall 41
Green Tree 44
Raspberry-cane Tree . 42
Spring 41
Crickets 41
Camel 41
Ground 41
Tree 41
Criddle, Norman, articles by 15, 41, 47, 66
Crinoids 93
Cristivomer namaycush 66
Crossbill 135
American 164
Red 46
White-winged . . . 13, 46, 64

INDEX—*Continued*

PAGE

Crow....14, 27, 45, 67, 74, 80, 95, 99, 135, 147, 164, 175.
Crowfoot.... 125
Crustaceans, Euphyllopod 95
Cryptoglaux acadica acadica.... 147
acadica brooksi.... 134
Cryptogramma Stelleri 149, 150, 151, 152
Ctenucha,.... 106
Cuckoo, Black-billed 35, 147, 153
Yellow-billed.... 147
Cupulocrinus.... 85
Curlew, Eskimo....72, 140
Long-billed.... 52
Cyanocitta cristata....76, 164
cristata bromia.... 76
cristata cristata.... 147
stelleri carlottæ.... 135
Cyclocystoides.... 85
anteceptus.... 85
Cyclospira bisulcata.... 86
Cynipidæ.... 171
Cypripedium hirsutum...95, 173
parviflorum....61, 173
passerinum.... 61
Cyprinoids.... 27
Cystopteris bulbifera....151, 152

Dafila acuta....62, 104
Damsel-flies.... 127
Danaus archippus.... 142
Darapsa pholus.... 106
Dairdson, Prof. John, article by.... 168
Deer, Black-tailed.... 103
Mule.... 59
Red.... 102
White-tail.... 59
De Lury, Justin S., article by.... 137
Ralph E., articles by 119, 120, 137
Dendragapus obscurus sitkensis....53, 133
Dendrocrinus.... 85
Dendroica æstiva....64, 166
æstiva æstiva....46, 148
auduboni.... 79
caerulescens.... 166
caerulescens caerulescens....46, 148
castanea....46, 148, 166
cerulea....120, 148
coronata....46, 148, 166
discolor....149, 176
fusca....46, 149, 166
magnolia....46, 64, 148, 166
palmarum hypochrysea 46
palmarum palmarum 137, 149
pensylvanica....148, 166
striata.... 149
tigrina....148, 166
townsendi.... 136

PAGE

Dendroica vigorsi.... 177
vigorsi vigorsi.... 149
virens....46, 149, 166
Desmostylus....122, 123
hesperus.... 122
sookensis n. sp.... 122
watasei.... 122
De Vany, J. L., article by. 16
Dickerogammarus fasciatus 178
Dictydium cancellatum.... 130
Diderma spumarioides.... 130
Dielytra spectabilis.... 156
Dina fervida.... 8, 39
parva.... 8, 39
Disappearance and Recovery of the Bluebird... 71
Distribution of the Ottawa Trenton Echinoderm Faunas.... 84
Diver, Great Northern... 73
Diving Birds.... 18
Dobson.... 106
Dogwood....3, 169
Dolichonyx oryzivorus....45, 147
Dolomite, Guelph.... 108
Dove, Mourning....80, 99
Dovekies.... 97
Dragonflies....108, 126, 157
Drosera longifolia.... 125
Drury, Dru, review of account of his life.... 75
Dryobates pubescens.... 162
pubescens medianus.45, 147
villosus....63. 162
villosus picoideus—....facing page 121, 134
villosus villosus....45, 147
Dryocampa, Rosy.... 106
Dryopteris.... 150
Duck, Black..35, 68, 79, 83, 129
Harlequin.... 180
Labrador....72, 140
Long-tailed....12, 15, 50
Old-squaw.... 104
Ruddy....27, 29
Scaup....14, 15, 62, 162
Strange Actions of a.. 16
Wood.... 79
Duck Hawk, The.... 33
Dumetella carolinensis.... 149
Dymond, J. R., article by. 142

Eagle, Bald....74, 134, 162
Echinoderm faunas.... 84
Ectenocrinus.... 85
Edrioaster.... 85
Eglantine.... 109
Eider....45, 99, 155
American.... 155
King....50, 79
Northern.... 50
Eiders, A Family of.... 58
Elaeagnus argenteus.... 61
Elderberries.... 3

PAGE

Empidonax difficilis.... 135
flaviventris....45, 147
minimus....64, 147, 163
trailli.... 163
trailli alnorum.... 45
Empusa grilli.... 68
Endule mendica.... 106
Enodia portlandia.... 141
Epipactis.... 174
decipiens....173, 174
repens var. *ophioides* 173, 174
tesselata.... 174
Equisetum arvense.... 145
Ereunetes mauri.... 105
pusillus....63, 162
Erora laeta.... 141
Erpobdella punctata.... 8, 37
punctata annulata.... 8, 38
Erpobdellidae.... 8, 37
Esox lucius.... 66
Estheria caldwelli.... 96
Euconulus fulvus.... 132
Eumetopias jubata.... 103
Euphagus carolinus 13, 46, 64, 147, 164
cyanocephalus.... 13
Euphydryas phaeton.... 141
Eurema euterpe.... 141
European Hare in Ontario 142
Eurycea bislineata.... 100
Everes comyntas.... 141
Eye, Pearly.... 141

Falco columbarius.... 63
mexicanus.... 12
peregrinus anatum...33, 63
peregrinus pealei.... 134
rusticolus rusticolus... 12
sparverius....13, 63, 162
sparverius sparverius.. 147
Falcon, Peregrine.... 35
Prairie.... 12
Farley, F. M., article by.. 72
Feniseca tarquinius.... 141
Fern, Boot's Shield.... 151
Braun's Holly.... 150
Bulblet Bladder...151, 152
Lance-leaved Grape.. 151
Sensitive.... 151
Spiny Shield.... 151
Ferns.... 149
Ferns of Hatley, Stanstead County, Quebec, 1921-22; Further Notes on the.... 149
Figworts.... 124
Finch, Cassin's Purple.... 13
Purple....46, 80, 148, 164
Rosy.... 94
Fir, Alpine.... 114
Fisher.... 176
Flax, Least Toad.... 124
Fleming, J. H., article by. 15
Flicker....35, 63, 134, 163, 175
Northern 45, 64, 74, 147, 153

INDEX—*Continued*

PAGE

Flies, damsel ... 108
Flesh ... 66
gall ... 171
Flycatcher, Alder ... 27, 45, 74
Great Crested .. 68, 147, 163
Least .. 64, 74, 147, 153, 163
Olive-sided .. 45, 64, 74, 163
Traill's ... 163
Western ... 135
Yellow-bellied 45, 77, 147, 153
Foerste, A. F., article by .. 84
Forestry Essay Prize ... 138
Formica ... 157
Fossils ... 93
Fox, Continental Arctic ... 65
Fresh Water Leeches (*Hirudinea*) of Southern Canada ... 6, 37
Freshwater-Isopod ... 156
Freshwater-sponge ... 156
Fritillary, The Great Spangled ... 141
The Silver-spot ... 141
Frog, Green ... 57
Froggatt, Walter W., review of his "Some Useful Australian Birds" ... 118
Frogs ... 67
Fulica americana ... 29
Fuligo septica ... 130

Gadwall ... 90
Gale, Sweet ... 120
Galium boreale ... 61
Gallinago delicata ... 105
gallinago delicata ... 76
Gallinule, Florida ... 35
Gammarus fasciatus ... 178
limnaeus ... 177
Gastrocopta armifera ... 132
contracta ... 132
lappaniana ... 132
Gaultheria shallon ... 3
Gavia imber ... 62, 103
immer ... 28, 45
immer ellasson ... 78
pacifica ... 62
stellata ... 103
Gentian, Swamp ... 61
Gentiana sceptrum ... 61
Geometrids ... 106
Geothlypis trichas ... 166
trichas trichas ... 46, 149
Geranium, wild ... 108
Glaucidium gnoma grinnelli ... 54
Glendenning, R., article by ... 119
Glossiphonia complanata ... 7, 8
fusca ... 7, 9
heteroclita ... 7, 9
stagnalis ... 7, 9
Glossiphonidae ... 7, 8
Glyptocrinus ... 85
Glyptocystites ... 85
Gnathobdella ... 8

PAGE

Goats, Rocky Mountain— ... facing page 81
Gold Thread ... 108
Golden-eye, American 14, 15, 16, 62, 68, 74, 120
Barrow's ... 180
Golden-eyes ... 73
Goldfinch ... 46, 80, 148
American ... 164
Goniobasis livescens ... 132
sookensis ... 123
Goodyera ... 174
Pubescens ... 174
Goose ... 104
American White-fronted ... 62
Blue ... 77
Cackling ... 180
Canada 12, 62, 74, 81, 90, 147
Emperor ... 53
Greater Snow ... 50, 180
Lesser Snow ... 180
Snow ... 62
Gopher ... 67
Bush ... 119
Goshawk, American .. 63, 98, 133
Western ... 180
Grackle ... 35, 175
Bronzed 46, 60, 68, 75, 138, 148, 164
Rusty ... 164
Graham Island of the Queen Charlotte Group, A Biological Reconnaissance on ... 101, 133
Grand River, Rambling by the ... 107
Grass, of Parnassus ... 61
Yellow-eyed ... 125
Grasshopper, Carolina ... 42
Roadside ... 42
Grasshoppers, Manitoba .. 41, 66
Gratiola aurea ... 124
Grayling, Arctic ... 66
Grebe, Holboell's 27, 53, 62, 76, 103
Horned ... 73, 77
Pied-billed ... 28, 73, 161
Red-necked ... 73
Western ... 103
Grosbeak, Evening. 14, 60, 80, 137, 148, 153
Pine 14, 99, 129, 135, 148, 164
Rose-breasted 64, 68, 75, 148
Grouse, Canada Ruffed 45, 147, 153, 154
Dusky ... 53
Gray Ruffed ... 63
Ruffed ... 35, 63, 74, 78, 175
Sage ... 94
Sharp-tailed .. 15, 63, 66, 74
Sooty ... 133
Spruce ... 63, 74

Grus ... 105
americana ... 50
canadensis ... 50, 62
canadensis mexicana .. 76
mexicana ... 50
Gryllidae ... 41
Gryllinae ... 41
Gryllus luctuosus ... 41
pennsylvanicus ... 41
Guillemot, Black ... 45, 98
Pigeon ... 104
Gull, Bonaparte's ... 62
Franklin's ... 67, 74, 90
Glaucous ... 98
Glaucous-winged ... 104
Great Black-backed 14, 15, 20, 45, 99, 180
Herring ... 20, 45, 62, 73, 104, 147, 153, 162
Laughing ... 20, 180
Ring-billed .. 14, 15, 62, 162
Slaty-backed ... 62
Thayer's ... 20
Gulls ... 18, 67, 155
Gyrfalcon, Gray ... 12
White ... 58

Habenaria bracteata ... 173
clavellata ... 125, 173, 174
dilatata ... 173
hyperborea ... 173
lacera ... 173, 174
macrophylla ... 173
obtusata ... 173
orbiculata ... 173
Haematopus bachmani ... 133
Haemopis marmoratis ... 8, 10
grandis ... 8, 37
Haida Indians ... 101
Hairstreak, Acadian ... 141
Banded ... 141
Early ... 141
Striped ... 141
Haliæetus leucocephalus .134, 162
Halicoridae ... 123
Hare, European ... 142, 143
Macfarlane Varying .. 65
Harebell ... 150, 151
Harelda hyemalis .12, 50, 99, 104
Harrington, Paul, article by ... 177
Hawk, Broad-winged ... 45, 162
Duck ... 33, 63, 134
Fish ... 63, 162
Marsh ... 63, 74, 162
Pigeon ... 63
Red-tailed ... 63, 74, 134
Sharp-shinned 63, 133, 147, 162
Sparrow 13, 14, 63, 74, 147, 162, 175
Hedysarum ... 61
Hedysarum Mackenzii ... 61
Helicodiscus parallelus ... 132
Helodromus solitarius ... 63
Hemicystites ... 85
Hemlock, Mountain ... 115

INDEX—*Continued*

PAGE

Hemp ... 177
Heodes epixanthe ... 141
thoe ... 141
Heron, Great Blue 45, 59, 73, 74, 105, 147, 162
Green ... 35
Hesperiphona vespertina vespertina ... 148
Heteractitis incanus ... 105
Heteromeyenia macouni ... 157
Hewitt, C. Gordon, review of his "The Conservation of the Wild Life of Canada" ... 139, 157
Hirudinea ... 6, 37
Hirudinidae ... 8, 10
Hirundo erythrogaster 46, 136, 148
Honey-bee ... 60
Hornet, black and white ... 126
Howard, H. Eliot, review of his "Territory in Bird Life" ... 55
Hudsonaster ... 85
Hummingbird, Allan's ... 54
Ruby-throated 45, 99, 147, 153
Rufous ... 135
Hungarian or European Grey Partridge ... 91
Hyalella azteka ... 178
knickerbockeri ... 178
Hybocrinus ... 85
Hybocystites ... 85
Hydrochelidon nigra surinamensis ... 62
surinamensis ... 28
Hylocichla aliciae ... 65, 167
aliciae aliciae ... 149
fuscescens ... 167
fuscescens fuscescens ... 149
guttata ... 167
guttata faxoni ... 79
guttata nanus ... 136
guttata pallasi ... 46, 65, 149
mustelina ... 149
ustulata ... 167
ustulata swainsoni ... 46, 149
Hyloicus gordius ... 106
kalmiae ... 106
Hymenoptera ... 66
Hyphoraia parthenos ... 106
Hyssop, Golden Hedge ... 124

Ichthyobdellidae ... 8, 10
Icterus galbula ... 147
Inconnu ... 65
Indian Pipe ... 111
Injudicious Fossil Collecting ... 93
Iridoprocne bicolor 46, 64, 136, 179
Ivy, Poison ... 58, 95
Ixoreus naevius ... 136

Jackfish ... 66
Jaeger, Long-tailed ... 180
Parasitic ... 180
Pomarine ... 180
"Japanese Starling" in Vancouver, B.C. ... 32
Jay, Blue 14, 35, 74, 76, 147, 153, 164
Canada 14, 45, 64, 74, 77, 147, 164
Queen Charlotte ... 135
Johansen, Frits, articles by ... 156, 177
Johnson, C. E., articles by ... 60, 99, 100
Junco ... 14, 127, 135
Slate-colored 46, 64, 75, 148, 153, 165
Junco hyemalis ... 64, 165
hyemalis hyemalis ... 46, 148
hyemalis oreganus ... 135

Katydids ... 41, 44
Killdeer ... 35, 74, 90, 147, 162
Kindle, E. M., article by ... 111
Kingbird ... 45, 147, 163
Arkansas ... 177
Eastern ... 27, 35
Western ... 27, 35
Kingfisher ... 27, 35, 45, 134
Belted 14, 35, 63, 74, 153, 162
Kingiet, Golden-crowned 46, 136, 149, 167
Ruby-crowned 65, 73, 75, 149, 167
Klugh, A. Brooker, articles by ... 57, 156

Ladies' Tresses ... 110
Hooded ... 173
Lady, The Painted ... 141
Lady's Slipper, Northern ... 61
Showy ... 95, 110
Small Yellow ... 61
Yellow ... 110
Lagopus rupestris ... 63
Lanius borealis ... 99, 148
Lanivireo solitarius ... 166
solitarius solitarius ... 46, 148
Lark, Horned ... 95, 99, 163
Hoyt's Horned ... 13
Larus argentatus 45, 62, 104, 147, 162
delawarensis ... 62, 147, 162
glaucescens ... 104
hyperboreus ... 98
marinus ... 45, 99
philadelphia ... 62
shistisagus ... 62
Larvæ of *Phormia chrysorrhea* Macq. found upon nestling Bluebirds 116
Latax lutris ... 103
Latchford, Hon. Mr. Justice, article by ... 4
Lebetodiscus ... 85
Lectures to School Children ... 16
Leeches, Freshwater ... 6, 37
Leocarpus fragilis ... 130
Lepidurus arcticus ... 96
Lepus americanus macfarlani ... 65
europeus ... 143
timidus ... 142, 143
Leucosticte tephrocotis ... 94
Lewis, Harrison F., articles by ... 58, 98, 116
Libellulas ... 108
Lichen Growth and Snow Depth ... 113
Limnadia gigas ... 96
Limnetis brachyurus ... 96
gouldii ... 96
Linaria minor ... 124
Linnaea ... 108
Liparis Loeselii ... 174
Listera convallarioides ... 174
cordata ... 174
Lloyd, Hoyes, articles by 49, 116, 143, 178
Locust, Grouse ... 43
Lesser-migratory ... 43
Red-legged ... 43
Rocky Mountain ... 42
Two-striped ... 43
Locustinae ... 42
Loon ... 19, 27, 28, 45, 78, 103, 113, 126, 128, 153
Bide-a-Wee ... 113
Pacific ... 62
Red-throated ... 103, 137
Yellow-billed ... 77
Lophodytes cucullatus ... 104
Loxia curvirostra minor 46, 135, 164
leucoptera ... 13, 46, 64
Luna ... 107
Lutra canadensis ... 65, 103
Lutreola vison energumenos 65
Lycaenopsis pseudargiolus 141
Lycogala epidendrum ... 130
Lycopodium inundatum ... 125
Lymnaea ... 132
humilis modicella ... 132
Lynx, Canada ... 65, 119
Lynx canadensis ... 65

Macnamara, Chas., article by ... 99
Macoun, Prof. John, Autobiography of ... 39
Macrobasis murina ... 66
Macrobdella decora ... 8, 10
Macroplectrum sesquipedale 169
Magee, M. J., article by ... 153
Magpie ... 78, 79
Malaxis ... 174
Mallard 50, 62, 74, 79, 90, 104, 115
Manitoba Grasshoppers ... 41, 66
Mareca americana ... 62

INDEX—*Continued*

PAGE

Marila ... 162
americana ... 29
marila ... 62
vallisneria ... 62
Marshmarigold ... 110
Marten, Alaska ... 65
Queen Charlotte ... 103
Martes pennanti ... 176
Martin, Purple ... 148
May-fly ... 106
Meadowlark
35, 73, 97, 99, 116, 147, 161, 164
Western ... 64, 66, 117
Meadow Rue ... 108
Melanerpes erythrocephalus 147, 163
Melitae harrisi ... 141
Melospiza georgiana ... 46, 148
lincolni ... 135
lincolni lincolni ... 46
melodia ... 165
melodia melodia ... 46, 148
melodia morphna ... 135
Merganser ... 62, 73, 104
American ... 14, 15, 74
Hooded ... 104
Red-breasted 14, 45, 74, 162
Mergus ... 104
americanus ... 62
serrator ... 45, 62, 162
Merriman, R. Owen, article by ... 146
Mesentericus fuscus ... 78
Mesomphix inornata ... 132
Mice, pocket ... 67
Microstylis ... 174
unifolia ... 173
Microtus chrotorrhinus ... 138
pennsylvanicus ... 34
xanthognathus ... 65
Migration of the Brant (*Branta bernicla*) in Greenland ... 144
Migratory Birds Convention Act. Prosecutions 11, 50, 94, 154
Milkweed ... 142
Mink ... 176
Western ... 65
Mitrewort ... 108
Mniotilta varia ... 46, 148, 166
Moccasin Flower ... 110
Mocking Bird ... 78
Molothrus ater ... 164
ater ater ... 147
Monarch ... 142
Moore, J. Percy, articles by ... 6, 37
Moose ... 65
Morris, F. article by ... 123
Robert T., article by ... 60
Mosses, Club ... 125
Moth, Beggar ... 106
Hawk ... 106
Moths ... 106
Moulds ... 78
Mountain Beaver (*Aplodontia rufa*) ... 30

PAGE

Mouse, brown ... 127
Jumping ... 175
Keen ... 103
Mousley, Henry, articles by ... 137, 141, 149, 173
Mucilago spongiosa ... 130
Munro, J. A., articles by ... 1, 12, 26, 32, 35, 89, 114
Murre, Brunnich's ... 98
Common ... 20, 155
Murrelet, Marbled ... 104
Murres ... 97
Mus norvegicus ... 103
Muskrat ... 176
Northwest ... 65
Muskox ... 158
Mussels, fossil ... 121
Mustela americana actuosa 65
nesophila ... 103
vison ... 176
Myiarchus crinitus ... 147, 163
Myiochanes virens ... 147, 163
Myotis ... 103
Myrica californica ... 120
Gale ... 120
Myrtle, California ... 120
Mystacocetan ... 121
Mytilus ... 121, 123
edulus ... 111
Myxomycetes ... 129
Myxomycetes of the Lake Nipigon District ... 129

Nannus hiemalis ... 167
hiemalis hiemalis ... 46, 149
hiemalis pacificus ... 136
Nantucket Wild Flowers ... 40
Nature Lover's Camp in Nova Scotia ... 126
Nemobius ... 41
Neonympha eurytus ... 60
Nephelopsis obscura ... 8, 39
Nettion carolinense ... 62, 104
Newcombe, C. F., article by ... 120
Nighthawk
35, 64, 74, 100, 147, 153, 163
Northwest Game Act Prosecutions ... 12
Nuthatch, Red-breasted 46, 75, 136, 149, 167
White-breasted ... 14, 149
Nuttallornis borealis ... 45, 64, 163
Nyctea nyctea ... 134
Nycteis ... 141
Nymphs ... 108

Oak, Poison ... 95
Observations on the Birds of Baffin Island and Vicinity ... 49
Occurrences of the Meadowlark in Nova Scotia ... 116
Odocoileus columbianus ... 103
Œcanthinae ... 41

PAGE

Oecanthus nigricornis ... 42
Œdipodinae ... 42
Oidemia americana ... 104
deglandi ... 62, 104
perspicillata ... 62, 104
Old-squaw ... 15, 99
Olor ... 105
buccinator ... 144
Ondatra zibethica spatulata 65
Onoclea sensibilis var. *obtusilobata* ... 151
Oporornis philadelphia ... 46, 166
Orchid, Green Wood ... 125
Prairie Fringed ... 124
Round-leaved ... 61
Orchids ... 173
Orchids of Hatley, Stanstead County, Quebec, 1921-22. Further Notes on the ... 173
Orchis, Northern White ... 173
Ragged Fringed ... 173, 174
Rein ... 110
Showy ... 110
Small Wood ... 173, 174
Orchis rotundifolia ... 61, 173
Orcinus orca ... 102
Oriole, Baltimore ... 147
Bullock's ... 27
Orchard ... 77
Ornithological Occurrences at Toronto, Ontario, January, 1922 ... 13
Osprey ... 27, 45, 63, 74, 134, 153
Ostrea ... 123
Otocoris alpestris ... 163
alpestris hoyti ... 13
Ottawacrinus ... 85
Otter, Canadian ... 65
Land ... 103
Sea ... 103
Otus asio ... 134
asio asio ... 147
Oven-bird ... 46, 75, 128, 149
Owl, American Hawk 63, 68, 79
Burrowing ... 177
Coast Pygmy ... 54
Great Gray ... 63
Great Horned ... 45, 74, 127
Pygmy ... 77
Saw-whet ... 14, 134, 147
Screech ... 14, 134, 147
Short-eared ... 74
Snowy ... 50, 134
Oxyechus vociferus ... 162
vociferus vociferus ... 147
Oyster-catcher, Black ... 133

Pagurus arcadianus ... 157
Paint-brush, Indian ... 61
Palaeocrinus ... 85
Pandion haliaetus ... 162
haliaetus carolinensis 45, 63, 134
Papilio glaucus canadensis 142
polyxenes ... 142
Parks, National ... 51

INDEX—*Continued*

PAGE

Parnassia palustris 61
Parrot, Kea 78
Partridge European Grey 91
Hungarian 91
Partridge Berry Vine 108
Passeolus globosus 84, 85
gregarius 85
intermedius 85
Passer domesticus 46, 64
domesticus domesticus 148
Passerculus sandwichensis 64, 164
sandwichensis savanna 46, 148
Passerella iliaca 136
iliaca iliaca 148
iliaca townsendi 53
Passerherbulus nelsoni subvirgatus 46
Passerina cyanea 148, 165
Patch, Clyde A., articles by 101, 133
Pedetaithya grisegena major 76
Pedioecetes phasianellus 63
phasianellus campestris 15
Pelican, White 62, 73, 74
Pelicanus erythrorhynchus 62
Pellaea atropurpurea 150
Pemberton, C. C., article by 21
Penthestes atricapillus 167
atricapillus atricapillus 46, 149
hudsonicus 65
hudsonicus hudsonicus (littoralis) 46
rufescens 136
rufescens rufescens 13
Percosia obesa 66
Periglyptocrinus 85
Perisoreus barbouri 77
canadensis 64, 164
canadensis canadensis 45, 147
Peromyscus keeni 103
Petraster 85
Petrochelidon albifrons hypopolia 77
lunifrons 64
lunifrons lunifrons 46
Pettigrew, Mary, article by 107
Pewee, Western Wood 27, 35, 36
Wood 74, 147, 153, 163
Phalacrocorax auritus auritus 45
pelagicus robustus 104
Phasianus 133
Pheasant 133
Phloeotomus pileatus 163
Phoca vitulina 103
Phoebe 35, 64, 74, 147, 153, 163
Pholas penita 121
Phormia chrysorrhea 116
Phyciodes nycteis 141
Phymata wolffi 60

PAGE

Physa sayii warreniana 132, 133
Physarum compressum 131
globuliferum 131
polycephalum 131
viride 131
viride var. *aurantium* 131
Phytology 168
Picoides arcticus 45, 119, 162
Pigeon, Band-tailed 1, 133
Pigeon, Band-tailed, in British Columbia 1
Pigeon, Domestic 17, 60
Passenger 72, 118, 140
Pike 66
Pine, Western White 114
White Bark 114
Pinguicula 124
vulgaris 61
Pinicola enucleator 135, 164
enucleator leucura 99, 148
Pink, Grass 124
Pintail 62, 79, 90, 104
Pinus albicaulis 114
monticola 114
Pipilo erythrophthalmus erythrophthalmus 148
Pipit, American 65, 166
Piranga erythromelas 148
Piscicola punctata 10
Pisidium 4
abditum 6
adamsi 6
affine 6
compressum 5
compressum pellucidum 5
elevatum 6
glabellum 5
idahoense 5
noveboracense 6
sphaericum 6
splendidulum 5
subrotundum 6
variabile 5
virginicum 5
Pisobia bairdi 162
maculata 105
minutilla 45, 105
Pitcherplants 110, 124
Placobdella 7
parasitica 7, 9
phalera 7, 9
rugosa 8, 9
Plaintain, Menzies' 173, 174
Northern Rattlesnake 173, 174
Rattlesnake 110
Planesticus migratorius 46, 65, 168
migratorius migratorius 99, 149
migratorius propinquus 136
Planorbis parvus 132
Plectrophenax nivalis 64, 164
Plesiosaur 97
Pleurocystites 85, 86

PAGE

Plover, American Golden 63
Golden 105
Semipalmated 45, 63, 80, 105
Upland 67
Plume-wing 106
Podilymbus podiceps 28, 161
Pogonia 124, 173, 174
Pogonia, Rose 110
Polyartemia forcipata 96
Polygalas 110
Polygonia 141
interrogationis 141
Polygyra albolabris 132
monodon 132
monodon fraterna 132
thyroidus 132
tridentata 132
Polyphemus 107
Polypody, Common 150
Polystichum Braunii 150
Pomatiopsis lapidaria 132
Pooecetes gramineus gramineus 46
Porocrinus 85
Porsild, Dr. Morten P., article by 144
Post-Glacial Terraces on the Eastern and Western Shores of the Gulf of St. Lawrence, Notes on 111
Potamogeton 90, 114
perfoliatus 115
Potentilla fruticosa 61
tridentata 150
Potter, L. B., article by 94
Prasopora 86
Preserving Order in a Bird Sanctuary 35
Primulas 95
Progne subis subis 148
Proposed Bird Sanctuary in British Columbia 26
Prosecutions 11, 50, 94, 154
Protaxocrinus 85
Protoclepsis occidentalis 7, 9
Prunus 3
Ptarmigan, Rock 63
Ptychoramphus aleuticus 104
Puffin 20, 155
Horned 20
Putorius haidarum 103
Pyramidula alternata 132
cronkheitei anthonyi 132
cronkheitei catskillensis 132
Pyrola, One-Flowered 110
Pyrola, Shin Leaf 110

Querquedula cyanoptera 28
Quiscalus quiscula 164
quiscula aeneus 46, 148

Racey, Kenneth, article by 30
Rafinesquina deltoidea 86

INDEX—*Continued*

PAGE

Rail, Black 76
Sora 74
Virginia 12
Rallus virginianus 12
Rana clamitans 57
Rangifer dawsoni 103
Ranunculus Flammula 125
Rat, Norway 103
Rats, Wood 87
Raven 135
American 164
Northern 45, 50, 64
Recent Breeding Record of the Trumpeter Swan in Alberta 143
Red Admiral 108, 141
Red-head 27, 29
Redpoll 13, 14, 99, 164
Redstart 46, 128, 149, 153, 166
Redwing, Northwestern 30
Regulus calendula 65, 167
calendula calendula 149
satrapa 46, 167
satrapa olivaceus 136
satrapa satrapa 149
Relation of Wild Life to Agriculture 47
Reteocrinus 85
Rhamnus purshiana 3
Rhopalocera 141
Rhopalocera or Butterflies of Hatley, Stanstead County, Quebec, 1921 - 22, Further Notes on 141
Rhus toxocodendron 95
typhina 146
vernix 95
Rhynchobdellae 7
Riparia riparia 46, 64
Robin 14, 35, 36, 46, 60 65, 75, 99, 149, 153, 168, 175
Western 136
Rosa gymnocarpa 171

Salal 3
Salamander, Two-lined 100
Saltatoria 41
Sambucus 3
Sanderling 105
Sandpiper, Baird's 162
Bartramian 77
Least 45, 105
Pectoral 105
Priblof 53
Red-backed 78
Semipalmated 63, 162
Solitary 63, 74
Spotted 35, 45, 63, 74, 90, 105, 128, 162
Western 105, 180
Sapsucker, Red-breasted .. 134
Yellow-bellied 63, 74, 100, 147, 163
Sarcophagidae 66
Sarracenia 124

PAGE

Saunders, W. E., articles by 137, 138
Saw-flies 170
Sayornis phoebe 64, 147, 163
Scallop-shell 106
Scapholeberis cornuta 156
Scaup 90, 91, 115
Schizocrinus nodosus 84
Sciurus hudsonicus 65
Scoter, American 14, 15, 104
Surf 62, 104
White-winged 62, 74, 90, 104
Scotiaptex nebulosa 63
Scrophulariaceae 124
Seal, Harbor 103
Sea-lion, Steller 103
Sea-urchins 121
Seiurus aurocapillus 46, 149, 163
noveboracensis 65
noveboracensis noveboracensis 46, 149
Selasphorus rufus 135
Setophaga ruticilla .. 46, 149, 166
Shells from Goderich, Ontario, A List of 132
Shoveller 62
Shrew, Queen Charlotte .. 103
Richardson's 177
Shrews 67
Shrike, Northern 14, 99, 148
Sialia currucoides 65
mexicana occidentalis . 13
sialis 168
sialis sialis 149
Siderastrea vancouverensis . 123
Silver-spot, The Mountain 141
Silver Spots 108, 127
Siskin, Pine 46, 73, 135, 148, 178
Sitta canadensis 46, 136, 149, 167
carolinensis carolinensis 149
Skippers 142
Skua 53
Chilean 53
Skunk 67
Skunk Cabbage 110
Smith, H. A. P., articles by 17, 58
Smith, Harlan I., article by 15
Smith, F. Napier, articles by 68, 96
Snakes 67
Snipe, Old World Jack ... 76
Wilson's 68, 70, 74, 76, 99, 105
Snowflake 64
Snyder, L. L., articles by . 58, 60
Somateria 99
mollissima borealis ... 50
mollissima dresseri ... 45
spectabilis 50
Some Inter-relationships of Botany and the Sister Sciences 168
Some Notes on the Growth of *Arbutus Menziesii* Pursh 21

PAGE

Sooke Formation, Vancouver Island, B.C., Some Notes on the .. 121
Soper, J. Dewey, articles by 59, 157, 175, 177
Sorex longicauda elassodon richardsoni 103 177
Sparrow, Acadian Sharp-tailed 46
Chipping 35, 46, 64, 75, 148, 165
Clay-colored 75
English 46, 64, 77
Field 148
Fox 136, 148
Grasshopper 77
House 75, 80, 148
Lincoln's 46, 73, 75, 135, 153
Savannah 46, 73, 75, 148, 164
Song 14, 46, 75 99, 135, 148, 153, 165, 175
Sooty Song 27
Swamp 14, 46, 75, 148
Townsend Fox 53
Tree 14, 35, 148, 165
Vesper 46, 73, 153, 161
Western Chipping ... 64
Western Savannah ... 64
White-crowned 64, 148, 165
White-throated 46, 64, 75, 129, 148, 153, 165
Spatula clypeata 62
Speechly, H. M., articles by 138, 156, 177
Sphaeriidae, Canadian 4
Sphaerium striatinum 132
Sphinx geminatus 106
Sphyrapicus ruber 134
varius 63, 163
varius varius 147
Spinus pinus 46, 135
pinus pinus 148
Spiranthes Romanzoffiana . 173
Spizella monticola 165
monticola monticola ... 148
passerina 64, 165
passerina passerina .. 46, 148
pusilla pusilla 148
Spleenwort 61
Spoon-bill 74
Sporozoa 160
Springer, Frank, review of his "New Species of Devonian Crinoidea from Northern Canada" 56
Squaledont bariensis 121
Squirrel, Franklin's Ground 119
Hudson Bay Red 65
Red 60, 119, 127
Star Flower 108
Starling 15, 78, 96, 99
Chinese 54
Japanese 32

INDEX—*Continued*

PAGE

Stemonitis ferruginea 131
fusca 131
herbatica 131
splendens 131
Stenaster 85
Stenodus mackenzii 65
Sterna hirundo 62
paradisaea 62
Sternberg, C. M., article by 97
Strawberries 108
Strongylocentrotus purpuratus 121
Strophomena trilobita 86
Strymon acadica 141
calanus 141
liparops 141
Sturnella magna 97, 164
magna magna 116, 147
neglecta 64
Sturnus vulgaris 15, 96
Succinea ovalis 132
Sulphur, Little 141
Sumach, Poison 95
staghorn 146
Summer Birds of Advocate, Cumberland County, Nova Scotia 44
Summer Birds of the Lac la Biche and Fort McMurray Region 72
Sundew 110
Sundew, Long-leaved 125
Sun-spots 169
Surf-bird 105
Surnia ulula caparoch 63, 68
Swallow 27
Bank 46, 64, 75
Barn 46, 136, 148
Cliff 46, 64, 75, 77
Tree 35, 37, 46, 64, 75, 136, 153, 179
Swallow-tail, The Black .. 142
Tiger 142
Swan 105
Trumpeter 143, 144
Swift, Chimney .45, 78, 147, 153
Synaptomys borealis 177
Systaechus vulgans 66

Taeniaster 85
Tamias 175
Tanager, Scarlet 35, 68, 108, 148, 153
Tattler, Wandering 105
Taverner, P. A., articles by 59, 71, 81, 95, 119
Taylor, W., article by 113
Teal 79
Blue-winged 74, 90
Cinnamon 28, 54, 180
Green-winged 62, 104
Telmatodytes palustris plesius 30
Tent-caterpillar 170

PAGE

Tern, Black 27, 28, 62, 74
Common .. 62, 74, 79, 90, 91
Gull-billed 180
Least 180
Terns 18, 155
Tettigoniidae 41
Thalarctos maritimus 65
Thelypteris 150
Boottii var. *multiflora* 149, 151
Clintoniana x *Goldiana* 150
Clintoniana x *marginalis* 150
cristata x *Goldiana* ... 150
cristata x *marginalis* .. 150
spinulosa 149, 150, 151
spinulosa var. *americana* 150
Thompson, Stuart L., articles by 13, 161
Thomson, R. B., review of his "A Guide to the Poisonous Plants and Weed Seeds of Canada and the Northern United States" 138
Thrasher, Brown 35, 149
Thrush, Gray-cheeked 65, 149, 167
Hermit 46, 65, 75, 79, 129, 136, 149, 153, 167
Olive-backed 46, 65, 149, 167
Varied 136
Willow 75
Wood 149
Thryomanes bewicki borbonius 77
Thymallus singifer 66
Tip, The Violet 141
Tiger-moth 106
Toads 67
Tortoise, The Compton ... 141
Tortoise-shell, The American 141
Tortoise Shells 108
Tolanus flavipes 63
melanoleucus 63, 105
Towhee 77, 148
Townsend, Charles W., articles by 17, 44, 138
Toxostoma rufum 149
Trailing Arbutus 110
Trichia decipiens 131
favoginea 131
persimilis 131
varia 131
Trilliums 108, 110
Troglodytes aedon 167
aedon aedon 149
Trout, Lake 66
Tryxalinae 42
Tsuga Mertensiana 114
Tubifera ferruginosa 131
stipitata 131

PAGE

Tufts, R. W., articles by 98, 152, 177, 178, 179
Turnstone, Black 133
Ruddy 105
Twenhofel, W. H., review of his "Faunal and Sediment Variation in the Anticosti Sequence" 56
Tyrannus tyrannus .. 45, 147, 163

Union, American Ornithologists', meeting of 15
Unionidae 132
Urasterella 85
Ursus americanus 65
carlottae 103
Usnea barbata 113, 114
Utricularia cornuta 124
gibba 125
intermedia 124
purpurea 125
resupinata 124
vulgaris 123

Vallonia excentrica 132
Vanessa atalanta 141
cardui 141
virginiensis 141
Veery 149
Vermivora celata lutescens 136
peregrina 46, 166
ruficapilla 166
ruficapilla ruficapilla 46, 148
Viceroy 142
Violets 108
Vireo, Blue-headed .46, 148, 153
Philadelphia .. 64, 76, 77, 80
Red-eyed ... 27, 46, 64, 75, 99, 128, 148, 153, 166, 175
Solitary 166
Warbling 75, 148
Vireo philadelphicus 64
Vireosylva gilva gilva 148
olivacea 46, 64, 148, 166
Vitrea binneyana 132
ferrea 132
hammomis 132
indentata 132
lamellidens 132
Vole, Chestnut-cheeked ... 65
Northern lemming ... 177
Rock 138
Vulpes lagopus innuitus ... 65
Vulture, Turkey 178

Wagtail, Black-backed Kamchatkan 79
Walker, Bryant, article by 132
Wanderer, The 141
Warbler, Bay-breasted 46, 148, 166
Black and White 46, 75, 128, 148, 166

INDEX—*Continued*

PAGE

Warbler, Blackburnian 46, 129, 149, 166
Black-poll 149
Black-throated Blue 46, 148, 153, 166
Black-throated Green 46, 128, 149, 153. 166
Canadian..46, 128, 149, 166
Cape May.....148, 166
Cerulean.....120, 148
Chestnut-sided 128, 148, 166
Golden-winged..... 80
Hooded..... 78
Magnolia 46, 64, 128, 148, 153, 166
Mourning.....46, 77, 166
Myrtle 46, 75, 128, 148, 153, 166
Nashville.....46, 148, 166
Northern Parula....46, 148
Orange-crowned..... 136
Palm.....137, 149
Parula..... 166
Pine.....149, 177
Prairie.....149, 176
Tennessee.....46, 75, 166
Townsend's..... 136
Wilson's.....136, 149, 166
Yellow.....27, 35, 46, 60, 64, 75, 128, 148, 166
Yellow Palm..... 46
Warblers..... 166
Wasp, mason..... 127
orange and black.... 127
yellow jacket..... 127
Water Birds of Lake Newell, Alberta, Notes on the..... 89
Water-Thrush.....46, 65, 149
Grinnell's.....65, 75
Northern..... 73
Waxwing, Bohemian..... 148
Cedar 13, 35, 46, 148, 153, 165
Weasel.....15, 67
Haida..... 103

PAGE

Weed, Jewel..... 99
Whale, Killer..... 102
Whelk..... 157
Whip-poor-will....108, 147, 175
White, E. G., article by... 119
Whitefish..... 65
Whittaker, E. J., article by 93
Whittaker, E. J., review of his "The Fossil Molluscan Faunas of the Marl Deposits of the Ottawa District".... 56
Wieland, G. R., review of his "Two New North American Cycadeoids" 56
Willet.....17, 152
Willet Census in Nova Scotia..... 152
Williams, M. Y., article by 61
Wilson, Alice E., review of her "The Range of certain Lower Ordovician Faunas of the Ottawa Valley, with Descriptions of some new Species"..... 56
Wilsonia canadensis.46, 149, 166
pusilla.....136, 166
pusilla pusilla..... 149
Window-pane Visitors in Yarmouth County, Nova Scotia..... 106
Woodcock, American..... 68
Woodpecker..... 134
Arctic Three-toed 45, 119, 162
Downy..... 14, 45, 74, 147, 153, 154, 162
Hairy 14, 45, 63, 147, 153, 162
Lewis'..... 13
Northern Hairy..... 74
Pileated.....74, 163
Queen Charlotte Island.....facing page 121
Red-headed....14, 147, 163

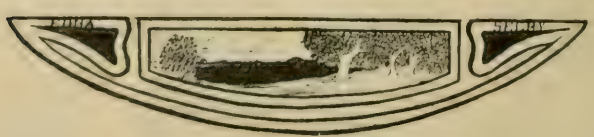
PAGE

Wood Rats and Grizzly Bears..... 87
Wood-satyr, Little..... 60
Wood Satyrs..... 108
Woodsia, Crag..... 124
Rusty..... 151
Smooth..... 151
Woodsia alpina.....150, 151
glabella..... 151
ilvensis.....149, 150, 151
scopulina..... 124
Wren, Bewick's..... 77
House 35, 37, 75, 77, 149, 167
Interior Tule..... 30
Marsh..... 27
Vigors'..... 77
Winter 46, 128, 136, 149, 153, 167

Xanthippus..... 42
Xanthocephalus xanthocephalus..... 29
Xanthotype crocataria..... 106
Xyris flexuosa..... 125

Yarrow..... 61
Yellow-legs, Greater.63, 74, 105
Lesser.....63, 74
Yellow-throat.....27, 75
Maryland.46, 128, 149, 166

Zamelodia ludoviciana...64, 148
Zapus..... 175
insignis..... 175
Zoarces anguillaris..... 160
Zonitoides arborea..... 132
minuscula..... 132
Zonotrichia albicollis 46, 64, 148, 165
leucophrys.....65, 165
leucophrys gambeli.... 64
leucophrys leucophrys. 148



The Canadian Field-Naturalist

VOL XXXVI OTTAWA, ONT., JANUARY, 1922. No. 1

THE BAND-TAILED PIGEON IN BRITISH COLUMBIA.

By J. A. Munro, Okanagan Landing, British Columbia.

The Band-tailed Pigeon has achieved celebrity through its relationship with the extinct Passenger Pigeon. Together with the Mourning Dove, it shares the distinction of being the only Canadian kin of their illustrious connection and the periodic newspaper stories of Passenger Pigeons surviving in the West have always been traced to one of these species. In reality the Band-tailed Pigeon has little resemblance to the extinct species except in its feeding habits and game qualities.

The adults of both sexes are alike although there is considerable individual variation; head and under surface of body vinaceous drab,* becoming richer on the chest and crown and fading to light gray on the throat and to white on the abdomen; back deep mouse gray, slightly glossed with iridescent olive in some specimens; a patch of iridescent green margined with a white collar on back of neck; upper surface of folded wing, rump, and base of tail clear Paynes gray; deepening to dusky neutral gray near middle of tail, the darker color forming a black band in sharp contrast to the pale mouse gray on terminal third of tail feathers; flight feathers chætura black with white line on margin of outer web; feet orange; bill orange with terminal third black; naked eyelids light jasper red; irides rose doree with inner ring of silver. The juvenals are sombre editions of their parents, lacking the iridescent patch and white collar on back of neck and with the vinaceous drab replaced by deep mouse gray; in some individuals with drab feather tipping giving a stippled effect; feet mars yellow or clay color; bill similar with terminal third black; naked eyelids and irides violet plumbeous, the latter with inner ring of fuscous. In flight or when clustered in the tall dead trees they appear quite dark—almost black—and when feeding on the ground, slate blue is the dominant color.

The summer range of the Band-tailed Pigeon is from south-western British Columbia through western Washington, western Oregon to California, Mexico and Nicaragua and eastward to portions of Colorado, western Texas and Arizona. In the southern part of their range their migrations are chiefly zonal; they winter in the Transitional Zone and breed in the higher altitudes. Middle California is the northern limit of their winter range and probably the winter home of British Columbia, Washington and Oregon birds. In Canada their distribution is over a relatively small area, being restricted to southwestern British Columbia west of the Cascade Mountains, including Vancouver Island and the Gulf Islands, and here they are known only as summer residents.

Early in May when seeding has commenced in the fertile Fraser Valley, pigeons make their initial appearance; first a small band is noted (with a thrill of interest if the observer be a bird-lover and with disgust tempered by resignation if he be a farmer), then larger flocks appear, and finally comes an invasion. While their arrival from the south is at approximately the same time each year, their appearance in any given locality is uncertain and the size of the flocks variable. Large numbers may visit a district for a few days or only small bands may appear and in adjacent areas of the same type they may not be seen at all. For example, in the spring of 1920 they were very plentiful on Sea Island and Lulu Island. The following year few were seen there and in the Boundary Bay districts thirty miles distant, farmers were complaining of the great flocks that were feeding on their seed grain. During some years they are locally abundant in the spring and scarce in the fall, or vice versa. In the years when they do come in large numbers, farmers insist that their appearance is coincident with seeding operations.

For possibly three weeks after their arrival they remain in flocks and their vagrant wanderings during this period follow no known laws. Nesting begins early in June and the large flocks are then broken up. There are, however, small flocks always in evidence, presumably males and non-breeding birds, and at this time they are seen less

*The 1921 edition of Ridgway's Color Standards and Color Nomenclature is used in this description.

about the fields and more frequently in the timber. Few nests of the Band-tailed Pigeons have been found in British Columbia, indeed, the discovery of a nest even in the Western United States where so many ornithologists are in the field is deemed worthy of special record. A discussion of their nesting habits, however, does not come within the scope of this article; suffice it to say that they do not breed in colonies as did the Passenger Pigeon, and that their solitary nesting has been the chief reason for their continued existence. Like the Passenger Pigeon, only one young is raised by each pair in a year. Early in August, when the young are full grown, they once more gather in flocks and forage in the woods and fields until their departure in September. There seems little doubt that the protection afforded this species under the Migratory Birds Convention has been the cause of a considerable increase in British Columbia. Some settlers who have taken up land within the past ten years are under the impression that their appearance in British Columbia is a recent one—another of nature's aggressions—while old-timers recall early days when their number was legion. A resident of Saanichton, Vancouver Island, informed me that during 1911 only one pair of pigeons was seen on his farm of eight hundred acres; that in subsequent years they appeared in varying numbers at different seasons but were not considered a menace to crops until the spring and autumn of 1919.

Pigeons arrive in British Columbia when their natural food is at its lowest ebb. It is supposed that before the days of agriculture in this province, they subsisted entirely on what dried berries, seeds, cherry stones, acorns, etc., could be discovered under the fallen leaves in the forest, probably eked out by buds and tender leaves. When in later years they found grain-planted clearings in the timber where once they had foraged industriously for a scant sustenance, it is natural to suppose that this highly concentrated food offered in abundance during a season of scarcity should have exerted a marked influence on their feeding habits. Grain-eating probably has become more of a racial habit in the northern birds than in those that breed farther south, owing to the fewer indigenous varieties of seed and berry producing plants found in the north. Contrasted with California's wealth of oaks, manzanitas, madrones and other fruit-bearing trees, British Columbia is relatively poor in such food. The oak, for example, is restricted to a small portion of Vancouver Island.

Assuming that birds follow the migration routes of their ancestors, it follows that the pigeons now breeding in British Columbia are of British Columbia extraction and have had little commerce with, for instance, those resident in California, where their migrations are chiefly altitudinal. It is thought that individuals, or groups of individuals, among many species of birds develop certain habits in harmony with their environment and that these habits persist in their descendants even though they are foreign to the species as a whole. Under some conditions Blackbirds and Robins become habitual fish-eaters, yet fish-eating is not a racial habit. The Loon in the northern lakes of Ontario feeds on mullet and *Cyprinoids* and is apparently designed for the delight and edification of tourists; in the mountain lakes of British Columbia he is a trout-eater, a duck-killer, and is execrated by sportsmen. On the prairie the Mallard fattens in the grain fields, on Vancouver Island he grows rank on a diet of rotten salmon; the list could be extended indefinitely. That species are not a fixed quantity but undergo various physical modifications due to climatic and topographical conditions is an axiom of modern science. That there frequently are important modifications of their feeding habits as a result of peculiar local conditions is not so generally recognized; at least no emphasis is laid on this point in the current literature of economic ornithology. The point I am trying to make is this; the economic status of the Band-tailed Pigeon in British Columbia is a problem for our own solving and our conclusion must be based on the results obtained from field work in this province.

In the spring and autumn of 1921, while gathering data on this question, I interviewed a number of farmers in the pigeon districts. All were agreed that pigeons were responsible for a great deal of damage, but their opinions regarding the nature of this damage were greatly at variance. In one district I was told that pigeons took only seed grain when newly planted; in another district they were said to do the most damage to sprouted grain. Farmers in other districts stated that little damage was done in the spring but that in the late summer they attacked the stooked grain while in still other districts I was informed that only fruit was taken in the autumn but that their damage to newly planted crops frequently entailed a second sowing. Taking into consideration the erratic nature of the species I am inclined to think that all these opinions are more or less correct.

It is thought that under ordinary conditions the amount of seed wheat, oats, or barley taken by pigeons has little effect on the harvest. Early in June, I examined a ten acre field of wheat ove

which about one hundred pigeons had fed until the seed sprouted. The plants were then two inches high and no evidence of damage could be found. In August I examined this crop again and it appeared to be of normal proportions. Pigeons when feeding over a newly planted field take only the surface grain. The amount of seed available would depend on the care taken in sowing; if sown broadcast on newly ploughed land and then harrowed in, as sometimes is done, a larger percentage of seed would be exposed than when a drill had been used, Whether the loss of this grain is of importance or not is a matter for agricultural experts to decide. I have received emphatic statements to the effect that surface grain germinates and matures, and equally emphatic denials of this. Be that as it may, there is no question regarding the amount of grain pigeons are able to consume. Their crops are capable of enormous distention and will hold at least a half-pint of grain. Under exceptional conditions such as the exposure of a large percentage of seed by heavy rains the loss through pigeons might entail a second sowing.

When about to feed they usually arrive on the scene in flocks of open formation with many stragglers in the rear and first alight in the adjacent trees. Tall dead firs or cedars are always favorite perching trees. In a short time they descend to the ground, not in a body, but in detachments. Systematically they work across the fields, those in the rear constantly flying over those in front to reach fresh ground. A number of birds are always in the air and the flock, advancing rapidly, soon reaches the edge of the crop. At all times they are wary and frequently will rise suddenly from a field for no apparent reason. Their habit of alighting in trees before commencing to feed is probably the reason why fields surrounded by timber, or those in which isolated trees have been left standing, are selected for their concentrated attacks.

After the grain has sprouted, they usually leave for freshly planted fields, if such be available. If not, it is likely that further damage will be caused by their pulling out the sprouts. I have not seen instances of this but have it on good authority that such damage does occur. It is also claimed that at this time pigeons scratch to uncover the seed, but this is a matter that will require investigation.

From the time seed is planted until the grain is harvested a crop is subject to many factors that may reduce the yield, therefore it is a difficult matter to estimate the reduction due to the presence of pigeons in the spring. The extent of their damage to stooked grain on the other hand is readily computed. The presence of pigeons on the stooks is conclusive evidence that they are lessening the farmer's profit by every kernel consumed, and to reckon the extent of such loss merely requires that the number of pigeons present be multiplied by the average crop contents of a few birds and the result reduced to dollars and cents on a daily per capita basis. For some obscure reason they often select a particular field of stooked grain for their operations and pass by identical fields in the immediate vicinity. They return here day after day and when the crop is threshed glean the waste grain among the stubble even when a more abundant supply is available on adjacent fields.

No complaints have been received of pigeons attacking standing grain and their damage to grain in the stook is confined to certain areas. No doubt this is largely governed by the abundance or scarcity of wild fruit. The species of fruit chiefly eaten are Cascara Sagrada, *Rhamnus purshiana;* Arbutus, *Arbutus menziesi;* Salal, *Gaultheria shallon;* Dogwood, *Cornus nuttalli:* Choke Cherries, *Prunus*, and Elderberries, *Sambucus*. On Vancouver Island acorns also form an important item in their food supply.

In the spring pigeons seem to prefer peas to any other food. As they pull up the young plants as well as take what seed has been left on the surface, serious damage to the crop may result if a large number of birds are present. A seventeen-acre field of peas, examined in May when the plants were two inches high, contained several areas forty to sixty yards in circumference, where pigeons had been feeding. At a distance these areas stood out as black patches against the prevailing green and a closer examination showed that two-thirds of the plants had been thinned out. While I was examining this field through bincoulars, a flock of about fifty birds alighted in one of these patches and commenced feeding. As I started to approach, they flew off in a long straggling flock, headed for the distant timber. If peas and grain are sown together the peas will be taken in preference to the grain. In the latter part of August I examined a crop of oats, barley, wheat and peas that had been grown for chicken-feed. Pigeons had fed over this field shortly after it was planted and the owner claimed that practically all the peas had been taken. Examination of the stooks seemed to corroborate his statement as very few pea vines could be found.

When studying Band-tailed Pigeons in the field one is impressed by their splendid game qualities. Their flight is vigorous and sustained and they are wary at all times. If they are surprised in the timber their departure is noisy and abrupt and

with a burst of speed that soon takes them out of shot-gun range. It is usually impossible to approach within range when they are feeding in the open, neither will they allow a close approach when they are in the perching trees. When pigeon-shooting was legal, a common practice of the hunter was to hide under a favorite perching tree and shoot the birds as they alighted. Many of these trees were dead giants, their tops high above the green timber, and as pigeons usually chose to settle on the topmost branches, the shooting was done chiefly with a 22 calibre rifle. Sometimes good shooting was had by the use of a blind and dead birds for decoys, and in some places the conditions were suitable for flight shooting. No matter how they were hunted a good bag tested the resources of the hunter. That this fine game bird will be preserved for future generations of sportsmen is indicated by their phenomenal increase during the past four years and incidentally this furnishes proof that the international protection of Migratory Birds is entirely effective.

CANADIAN SPHAERIIDAE.

BY THE HON. MR. JUSTICE LATCHFORD.

(*Continued from Vol. XXXV, p. 70*)

PISIDIUM

In 1821 Carl Pfeiffer established this genus to designate a group of the *Cycladidae*, as the *Sphaeriidae* were then called, which had but a single siphonal tube, and that, as he thought, at the anterior end of the shell. The syphon, however, projects from the end of the shell which is opposite to that from which the foot is protruded. Pfeiffer's error is due to the fact that the shell itself is shorter behind than in front of the beaks—a character which with the single siphonal tube distinguishes *Pisidium* from *Sphaerium* and *Musculium*.

The genus abounds throughout Canada. It occurs in great numbers in almost every pond and in the quieter waters of many of our lakes and rivers. From the clear cold streams in the Laurentian Hills it is usually absent, but it is found in every brook and ditch on the south side of Ottawa. The shells must be sought by sifting. They are invariably sunk in the sand or mud, and certain forms inhabit very deep water. As some do not exceed a millimeter or two in diameter a dredge with a very fine mesh should be used by the collector.

The *Pisidia* present exceptional difficulties in identification. The soft parts of species differing widely in external appearance are so similar that they have up to the present afforded no characters of value to the diagnostician. Externally the form or size of the same species is sometimes modified by varying conditions. The characters mainly relied on by systematists are those presented by the hinge teeth, which are complicated in structure and arrangement. They are fairly constant in any one species and different in every other species. It is on the details of the hinge that Mr. B. B. Woodward particularly relies in his monograph on the British and Irish *Pisidia* in the British Museum. (Catalogue of Species of Pisidium, Longman's, 1913.) His method is too technical to be more than mentioned here. Applying it with great labour and the utmost precision to the vast collections available to him he has reduced the number of species found in Great Britain and Ireland to seventeen, three of which are known only as fossils. His monograph with its thousands of figures is a monument to his industry and skill.

When the hinge teeth are considered in connection with external characteristics they seem to afford the best means of distinguishing one species from another. Yet so great are the difficulties presented in identifying all but a few of the genus found in Canada that I have been constrained to rely almost wholly on the judgment of Dr. Victor Sterki of New Philadelphia, Ohio, who has made these shells the subject of intensive study. He has accumulated material in vast quantities from all over the continent, and examined the collections in the National and other United States Museums, including what are supposed to be the type specimens of the earlier writers. In his Preliminary Catalogue, to which I have frequently referred in previous papers, he enumerates no less than one hundred and thirty species and varieties from Canada and the United States. In his monograph of the *Pisidia* on which he is now engaged there will doubtless be modifications of this list. In the meantime I follow it, and all identifications of shells which I have collected are given upon his high authority. His descriptions of new species are repeated with his permission.

But few shells of the genus were collected in the early years of the Club's activities. Heron's list

(Trans. 1, p. 40) contains only four species, two of which were not positively identified. Another species was added in the Report of the Conchological Branch, read March 13, 1890, and prepared by the writer and the late Rev. Geo. W. Taylor, which gives a catalogue of all the molluscs then known to be found in the vicinity of Ottawa. The success attending Roper and Winkley in Massachusetts and Maine and the encouragement extended by Dr. Sterki induced me to devote special attention to this genus. The result was that in my Preliminary List of Sphaeriidae published in *The Naturalist* in 1913, I enumerated twenty-three species of *Pisidia*, several of which were considered new. Since then I have added several others and the field is by no means exhausted. So numerous are the localities in which the sheils occur that many other species and varieties must remain undiscovered.

33. PISIDIUM VIRGINICUM Gmelin.—Heron found this shell on the beaches of Kettle Island exposed at low water. My only specimens were obtained in a similar situation lower down the Ottawa, and by dredging in the pond, prolific in small molluscs, on Duck Island—near the south end. With the exception of *P. idahoense.*, which has not been found in Ontario or Quebec, it is the largest known species, attaining frequently a length of 8 mm. It appears to be quite active and makes long and distinct furrows in moving. When mature it is always of a dark brown color near the umbones.

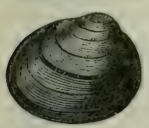


FIG. 6
P. virginicum, X 2

Mr. A. D. Robertson found *P. virginicum* abundant in sandy channels in the Georgian Bay (Contributions to Canadian Biology, Fasc. ii, 107), but appears not to have noticed there any other shell of the genus. The species has a wide range in the United States east of the Rocky Mountains, and extends even into Alaska and Yukon.

34. PISIDIUM IDAHOENSE ROPER. This shell ranges from Idaho westward to Washington and northward through British Columbia into Yukon. East of the Rockies it is found in the United States only in Michigan. Farther east it is not known to occur except in Prince Edward Island where it was found by Mr. C. Ives. This gentleman began the study of the mollusca after attaining the age of three score years and ten, and then became an indefatigable collector, especially of the smaller marine forms like *odostomia*, discovering several previously unknown. It is a matter of profound regret to many that impaired vision has prevented a continuance of his fruitful labors. Other *pisidia* found by him near his home are *compressum, abditum* and *variabile*. His sendings of P. *idahoense* from a pond near the east end of Prince Edward Island are identical in every characteristic with co-types received many years ago from Mr. Roper. The shell is of great size in comparison with the largest other species of the genus. I have several specimens from Mr. Ives which exceed 18 mm. in length.

35. PISIDIUM VARIABILE Prime. This species occurs in great numbers in many places near Ottawa. One such locality where no other member of the genus is found is a ditch running east and west on the Shouldis farm on Carling Avenue, south of the wood lot. When mature it is but slightly smaller than *virginicum* and never as dark in color. The shell is solid, inflated, inequilateral and oblique. The umbones are greatly elevated, full and prominent. In the vicinity of Toronto it is quite a common shell and is among the species collected by McInnes in the Attawapiscat.

36. PISIDIUM COMPRESSUM Prime. No shell of the genus is more common than this in the vicinity of Ottawa. It abounds in Hemlock Lake especially near the south-west angle where the banks of marl reach to the water's edge, and living molluscs form their shells from the remains of ancestors long dead. In Nepean it is found in Cave Creek and on the Magee and Shouldis farms; in the Ottawa on the shoals above Britannia pier; at Cornwall in the canal; in Lake Erie at Port Ryerse; and near Toronto at Richmond Hill and in the Etobicoke. On the Quebec side of the Ottawa it occurs in Chilcott Lake, near the outlet from the orchid swamp.

37. PISIDIUM COMPRESSUM PELLUCIDUM Sterki. At one time Dr. Sterki regarded this shell as entitled to specific rank. In his Preliminary Catalogue, however, he treats it as a variety of *compressum* from which it differs in size, being smaller. It is also less high, the beaks are less pointed; surface with lighter stripe, shell translucent.

38. PISIDIUM SPLENDIDULUM Sterki. A few small shells from Magee's Creek south of the Richmond Road (my No. 2547) are thought to belong to this widely distributed and variable species. It is desirable that additional specimens should be obtained. None could be found in the summer of 1921 on the only occasion on which I collected in this stream.

39. PISIDIUM GLABELLUM Sterki. Shells from the stream south and west of Graham Bay Station which I sent to Dr. Sterki in 1911 (his No. 6812) are referred to in his description of *P. glabellum* (*Nautilus*, XXVI, 137). He considered them attributable to the new species though somewhat

different in shape, having the superior margin more curved and the beaks narrower and more elevated. The types are from Hess Lake, Mich., but the species has a wide distribution from New England to Pennsylvania and Minnesota. It is described as having resemblance to small forms of *splendidulum*. The hinge is markedly strong and like that of *variabile* and *compressum*.

40. PISIDIUM ABDITUM Haldeman. Many forms now regarded as distinct were formerly thought to belong to this species. Dr. Sterki examined the authentic specimens, seven in number, from the Temple Prime collection. He states (*Nautilus*, XXVI, 6) that the description in Prime's Monograph of the Corbiculidea is quite inadequate even with respect to the form of the shells assumed to be the types, and that there are several geographical subspecies. I have found what Dr. Sterki regards as true *abditum* in Dow's Swamp and in a pond near Casselman. Heron does not, I think, give the locality in which he found the shells doutbfully assigned to this species.

41. PISIDIUM SPHAERICUM Sterki. Among a lot of shells collected at the extreme end of Gore Bay in the Manitoulin Islands was an almost globular *pisidium* which Dr. Sterki recognized as identical with a species known to occur from Maine to Virginia and long confounded with *abditum*. He described it in *The Nautilus*, XXIV, 8. It is stated to be easily distinguishable from larger forms of *abditum* by the large and prominent beaks situated close to the posterior end of the mussel, and the strong hinge. Average proportions are 100; 90; 76. My shells are all less than 5 mm. in length.

42. PISIDIUM ADAMSI (Prime) AFFINE Sterki. When Dr. Sterki described *P. affine* (1901) (*Nautilus*, XV, 66), he had seen no specimen of *adamsi*, and from the description of the latter species considered that the two were distinct. After examining the specimen of *adamsi* in the Prime collection he concluded that the two were specifically identical. The only *affine* I have found were procured in the large pond on the Metropolitan Electric Company's property, south of the Des Chenes Rapids.

43. PISIDIUM NOVEBORACENSE Prime. A wayside ditch between the third and fourth concession of Nepean, east of Fallowfield, was found to contain this shell in large numbers. It doubtless occurs in many other localities. Several varieties have been described by Dr. Sterki. The more typical form is thought to be that which is found in spring brooks.

44. PISIDIUM ELEVATUM Sterki. A streamlet formed by the overflow from springs in the Bell gravel pit near Britannia at one time afforded many examples of this shell. None could be found in the summer of 1921—perhaps owing to a lack of diligence on the part of the seeker after specimens. Dr. Sterki was disposed at first to consider the shells a variety of *noveboracense*, but in his catalogue lists it as distinct. I have found it only in the locality mentioned.

45. PISIDIUM SUBROTUNDUM Sterki. Though but recently recognized as distinct, this shell was long unnamed or doubtfully referred to other species. It has a wide distribution in Canada, being found from Jupiter River, Anticosti, to the Albany and Attawapiscat rivers in north-western Ontario, where it was found by Mr. McInnes. It is doubtless the unnamed *pisidium* from the Attawapiscat river referred to in report of the Bureau of Mines for 1912.

Near Ottawa the shell has been found in Dow's Swamp and in a spring on the Hare farm in Nepean. On the north shore of Lake Huron near Cutler a few specimens were obtained in a ditch beside the railway, north of the Indian village of Kashaboiwe.

(To be concluded.)

THE FRESH WATER LEECHES (HIRUDINEA) OF SOUTHERN CANADA

BY J. PERCY MOORE

Hitherto little has been published relating to the distribution of leeches in the Canadian Provinces and that little has been limited practically to the Great Lake shores of the Province of Ontario. The leech fauna of the latter region is fairly well known, especially since the publication of Miss Ryerson's paper on the extensive collections made in Georgian Bay under the auspices of the Dominion Biological Station and of Toronto University. This enumerates seventeen species in all. Twelve species, of which specimens were actually taken on the Canadian shore of Lake Erie, are listed in my own paper on the Hirudinea and Oligochoeta of the Great Lakes region. Earlier records from the Canadian side of the Great Lakes are by Verrill and Nicholson. Baird has described a single species from Vancouver and one from Great Bear Lake and here and there in the narratives of exploring expeditions and travelers in Canada casual references to the

occurrence of leeches are made.

For this reason the opportunity was welcomed of examining a small collection of leeches in the Victoria Memorial Museum (Ottawa), for which I am indebted to Mr. Fritz Johansen. The present paper presents these determinations, with transcripts from the labels (in quotation marks) of all specimens, so that all of the locality data may be specifically recorded. To these is added a list of leeches from Canadian localities in the collection of the Academy of Natural Sciences of Philadelphia. These are designated A. N. S. and include some of the material on which my paper referred to above was based.

The general result of this study is to establish that most of the leeches found in the fresh waters of the northern United States are distributed through the southern provinces of Canada. It is now possible to trace several species throughout the entire east and west width of Canada. It still remains to fix the northern limits of the range of most species, for there are practically no records except from the southern tier of provinces. That leeches abound in the numerous lakes of central and northern Canada may be expected. Several collections that have come to me from Alaska establish their occurrence in the far north, but these are reserved for description elsewhere. No species distinct from those known in the northern United States exists in the collection. A new subspecies is described but this has been known to me from several points in the northern states for about twenty years.

The following key will serve for the identification of the species listed:

I. Mouth a small pore-like opening in the disc of the anterior sucker through which the muscular pharyngeal proboscis may be protruded; no jaws. *Rhynchobdellae.*

A. Body not divided into two regions; usually much depressed; eyes near median line; stomach usually with well-developed lateral caeca; complete somites triannulate. Family *Glossiphonidae.*

a. Genital orifices separated by a single annulus; size small.

b. Eyes one pair, distinct; gastric caeca few and simple.

1. A brown cuticular nuchal plate and underlying gland on the dorsum of somite VIII; body capable of great extension; cutaneous papillae obsolete; color pale:—pink, gray or brownish. *Glossiphonia stagnalis.*

2. No nuchal plate or gland in the adult; body relatively broad and flat, incapable of great extension; cutaneous papillae few but variable in size and number; color brownish, either deeply pigmented in narrow longitudinal lines or diffuse with transverse rows of metameric white spots on the middie annuli of complete somites. *Glossiphonia fusca.*

bb. Eyes three pairs, arranged in three groups of two in a triangular figure; gastric caeca six pairs, very slightly branched.

3. Body broad and flat, moderately extensile; transparent, with little pigment. *Glossiphonia heteroclita.*

aa. Genital pores separated by two annuli; size medium or, for the family, large.

c. Eyes three or four pairs, all distinct, in two nearly parallel rows; size medium.

4. Eyes three pairs; body rather thick, incapable of great extension or flattening; opaque, usually heavily pigmented with brown, a dorsal and a ventral pair of narrow dark brown longitudinal lines for nearly the entire length, the former usually interrupted by pale metameric spots; gastric caeca seven pairs, little branched. *Glossiphonia complanata.*

5. Eyes four pairs; body thin and soft, capable of great extension; transparent, lightly pigmented with green and three series of small pale yellow spots; gastric caeca nine or ten pairs, moderately branched. *Protoclepsis occidentalis.*

cc. Eyes one pair, far forward, compound, fused in a common pigment mass; gastric caeca seven pairs, much branched. *Placobdella.*

d. Caudal sucker with numerous minute marginal papillae; size medium or small.

6. Moderately depressed, slender anteriorly; dorsal papillae usually in a median and two paired series, small but prominent and pointed. *Placobdella phalera.*

dd. Margin of caudal sucker smooth; size large.

7. Body very broad and much depressed; dorsal papillae few, low and smooth; integuments opaque; deeply pigmented in a conspicuous pattern of olive green and yellow. *Placobdella parasitica.*

8. Body very much depressed; dorsal papillae numerous, pointed and rough; integuments translucent; deeply pigmented in an irregular mixed pattern in which brown predominates. *Placobdella rugosa.*

AA. Body more or less distinctly divided into an anterior narrower and a posterior broader region, little depressed; eyes when present usually well separated; complete somites usually with more than three (six to fourteen) annuli; stomach usually with only a posterior pair of caeca which are more or less coalesced.
Family *Ichthyobdellidae.*
Unrepresented by any species in this collection.

II. Mouth large, occupying entire cavity of sucker; pharynx not forming a protrusible proboscis; jaws often present. *Gnathobdellae.*

B. Eyes five pairs, arranged in a regular arch on somites II-VI; complete somites five-ringed; muscular jaws usually with teeth present; genital organs highly complex; testes strictly paired (usually nine or ten); stomach with at least one pair of spacious caeca; size large. Family *Hirudinidae.*

e. Jaws prominent; teeth numerous, in one series; caeca along entire length of stomach.

9. Teeth about sixty-five on each jaw; genital orifices separated by five annuli; copulatory gland pores on somites XIII and XIV; penis short and conical; color dark green above, orange below, the dorsum with metameric median bright red and lateral black spots. *Macrobdella decora.*

ee. Jaws rather small and retractile into pits or obsolete; teeth when present few and coarse and in double series; caeca limited to a posterior large pair, the others vestigeal; genital orifices separated by five annuli; no copulatory glands; penis filamentous.

10. Jaws well developed, each bearing twelve to sixteen pairs of coarse teeth; color variable, green or brown and marked more or less thickly with very irregular non-metameric, usually confluent dark blotches. *Haemopis marmoratis.*

11. Jaws vestigeal, no teeth; color similar to 10 but the venter pale and the spotting generally sparser, coarser, more angular and less confluent; very large. *Haemopis grandis.*

BB. Eyes three or four pairs (rarely absent), usually one or two pairs on II and two pairs at the sides of the mouth on IV; complete somites five-ringed or more; no jaws; no gastric caeca; genital organs relatively simple; testes numerous, small, unpaired; size medium. Family *Erpobdellidae.*

f. Somites five-ringed; none of the annuli conspicuously enlarged or subdivided.

12. Genital orifices separated by two annuli; atrial cornua simply curved; vasa deferentia reaching forward to ganglion XI; eyes three pairs, the first largest; color pattern generally conspicuously longitudinally striped. *Erpobdella punctata.*

13. Like 12 but color pattern more or less strongly annular. *Erpobdella punctata annulata.*

ff. Last annulus (*f. 6*) of complete somites obviously enlarged and subdivided; eyes usualiy four pairs.

g. Atrial cornua spirally coiled.

14. Genital orifices separated by two annuli; vasa deferentia reaching forward to ganglion XI; color pattern plain or irregularly blotched with black. *Nephelopsis obscura.*

gg. Atrial cornua not spirally coiled but short and simply curved.

15. Vasa deferentia with loops reaching forward to ganglion XI; genital orifices separated by three and one-half annuli; eyes four pairs; nearly pigmentless. *Dina parva.*

16. Vasa deferentia not extending anterior to atrium; genital pores separated by two annuli; eyes three or four pairs; pigment absent or in scattered flecks. *Dina fervida.*

GLOSSIPHONIDAE

Glossiphonia complanata (Linnaeus)

"Alexandria Bay, Thousand Islands, N.Y., September 1, 1919. F. Johansen." One specimen.

"On stones in Fairy Lake, Hull, Quebec, May 5, 1918. F. Johansen." Two specimens. Besides the usual three series of marginal, intermediate and paramedian dorsal white spots there are a few scattered white spots.

"Ottawa River, near Hull, Quebec, October 13, 1918. F. Johansen." Four specimens with *Dina parva* and *Erpobdella punctata.* Dorsally these specimens are curiously mottled and sometimes reticulated with brown and white, and the brown lines broken into segments by regular white spots. Ventrally they have a greenish hue.

"In ditch at Ottawa (West), Ontario, November 10, 1918. F. Johansen." One specimen.

"Stream near Chelsea Road, Hull, Quebec, May 9, 1920. F. Johansen." Three specimens. Two are dark, with continuous black paramedian lines, the other paler and mottled, with the paramedian lines broken into a series of spots by pale blotches.

"Loch Lomond (near St. John), New Brunswick, October 7, 1920. A. G. Huntsman." One small specimen with *Nephelopsis obscura*.

"Pond on fields at Moose Factory, Ontario, July 14-15, 1920. F. Johansen." One typical example.

"A.N.S. No. 1183, Rondeau Harbor, East Swamp; A.N.S. Nos. 1184, 5, Long Point, Ontario, August 18, 21, 28." These three specimens together with all others from Rondeau Harbor and Long Point, were taken during Professor Reighard's survey of the Great Lakes and are listed in my report on the leeches.

Glossiphonia heteroclita (Linnaeus)

"Bight of Ottawa River (Hull Park), Quebec, July 6-7, 1919. F. Johansen." One specimen 8 mm. long, colorless, translucent and delicate. The eyes show the characteristic pattern but only the right one of the first pair is present.

"A.N.S. No. 1186, Long Point, Ontario, August 18."

"A.N.S. No. 1187, Rondeau Harbor, Ontario, August 28."

Glossiphonia (*Helobdella*) *fusca* (Castle)

"Rideau Canal, Ottawa, Ontario, June 16, 1918. F. Johansen." One typical specimen bearing two small packets of ten and twelve eggs respectively. There are five series of prominent brown papillae, the double character of those of the median series being clearly indicated by their frequent irregularity of position or duplication.

"McKay Lake, Ottawa, Ontario, June 22, 1919. F. Johansen." Two specimens, one of the fine-lined smooth type, the other with prominent papillae and black or dark-brown segmental spots. The latter bears five egg capsules.

"A.N.S. Nos. 1151, 2, 3, Rondeau Harbor, Ontario, August 28."

"A.N.S. Nos. 1154, 8, 9, Long Point, Ontario, August 18; No. 1856, the same, August 21."

"A.N.S. No. 3435, French River, Georgian Bay, Lake Huron, on shell of *Physa griv.* A. D. Robertson, 1913."

Glossiphonia (*Helobdella*) *stagnalis* (Linnaeus)

"Alexandria Bay, Thousand Islands, New York, September 1, 1919. F. Johansen." Two small specimens with pale nuchal plate, with a specimen of *G. complanata*.

"Pool at Tadousac, Quebec, September 6, 1919. F. Johansen."

"Stream near Chelsea Road, Hull, Quebec, May 9, 1920. F. Johansen."

"Pool at Catfish Bay, Hull, Quebec, May 16, 1920. F. Johansen." One typical example bearing eggs.

"A.N.S. Nos. 1174, 5, Rondeau Harbor, East Swamp, Ontario, August 28."

"A.N.S. Nos. 1176, 7, Long Point, Ontario, August 21 and 23."

Placobdella phalera (Graf)

This species does not occur in the Ottawa Museum collection, but is represented by five specimens in the Academy of Natural Sciences collection, all of which were taken during Professor Reighard's survey of the Great Lakes.

"Elmsdale, Nova Scotia, August 15, 1919, July 6 and 20, 1920, and May 23-28, 1921. A. H. Leim." One taken August 15 bears four capsules of eggs of four to six each.

A.N.S. Nos. 1204, 5, Rondeau Harbor, Ontario, August 28."

"A.N.S. Nos. 1206, 7, 8, Long Point, Ontario, August 16, 18 and 24 respectively."

Placobdella rugosa (Verrill)

"Elmsdale, Nova Scotia, August 15, 1919, June 29, 30, and July 13, 20, 1920. A. H. Leim." All small examples showing typical papillation. One taken August 15 bears young.

"Pools outside Hull, Quebec, October 5, 1919. F. Johansen." Leech with young ones new-born. One specimen 11 x 8 millimeters, longitudinally striped both above and below. Papillae moderate in size and number, but distinct. About a dozen young 2 mm. long in the bottle."

"Near Beaver Lake, Alberta, summer, 1907. A. Halkett." Two medium size, very rough specimens with *H. marmoratis* and *N. obscura*.

"A.N.S. No. 1201, Long Point, Ontario, August 23."

"A.N.S. Nos. 1202, 3, Rondeau Harbor, Ontario, August 28 and 24."

Placobdella parasitica (Say)

"A.N.S. No. 1191, Long Point, Ontario, August 19, 1899."

No examples of this species are found in the Ottawa Museum collection and only one Canadian specimen in that of the Philadelphia Academy. Professor Reighard, however, took it frequently during the explorations in Lake Erie, several times on the Canadian side, and Miss Ryerson found it common in Georgian Bay.

Protoclepsis occidentalis (Verrill)

"A.N.S. No. 3454, Black River, Prince Edward Island, August 24, 1912. Bayard Long."

This species has not previously been reported from Canada. It was not found by Miss Ryerson nor was it included in Professor Reighard's Lake Erie collections. It is, however, well known in the northern border states.

ICHTHYOBDELLIDAE

Piscicola punctata (Verrill)

"Elmsdale, Nova Scotia, June 5, May 23-28, 1921, dredged on mud bottom in from four to six feet. A. H. Leim."

These differ from the European *P. geometra* in the absence of eye spots from the caudal sucker and the very slight development of two annuli of complete somites so that only twelve instead of fourteen rings are obvious.

HIRUDINIDAE

Macrobdella decora (Say)

"Elmsdale, Nova Scotia, August 11, 1919; Enfield, Nova Scotia, July 12 and 15, 1920, 1 foot. A. H. Leim." Typical examples.

"Pembroke Lake, Grand Etang, Cape Breton Island, September 2, 1917. F. Johansen." A young individual 21 mm. long. The four groups of copulatory gland pores are plainly visible. With one *H. marmoratis* and nephelid egg cases.

"Burbidge, Quebec, July 23, 1918. C. L. Patch." Two specimens, one mature, the other not.

"Island Lake, Algonquin Park, Ontario, July 17, 1900. W. Spreadborough." Four mature specimens differing much in the amount of ventral blotching. One has only three groups of copulatory glands, the left posterior being absent. With one *Haemopis marmoratis*.

"On Dore, Qu'Appelle Valley, Saskatchewan, summer, 1907. A .Halkett." Four mature specimens with well-developed copulatory glands and clitella and with penes protruded. Two are plain, two spotted ventrally.

Another example 66 mm. long is in an unlabelled bottle with one *Erpobdella punctata*.

"A.N.S. No. 253, Lac Aux Sables, Quebec, 1894. Dr. W. E. Hughes."

Haemopis marmoratis (Say)

"In a freshwater pond, Amherst, Magdalen Islands, Quebec, middle of June, 1917. Philip Cox." One of a nearly uniform slate color.

"Elmsdale, Nova Scotia, May 22, June 1 and July 2, 1921. A. H. Leim."

"Neil Harbor, Cape Breton Island, July 29, 1917. Philip Cox." One 28 x 7 mm. Brown above with widely scattered small dark-brown spots; paler below with only three or four small spots. The left paired jaw bears eleven pairs of teeth.

"Pembroke Lake, Grand Etang, Cape Breton Island, September 2, 1917. F. Johansen." One sparsely spotted, medium-sized specimen with a young *M. decora* and nephelid egg cases.

"Mount Herbert, Prince Edward Island, September 3, 1919. J. Robert Mutch." A letter from the collector accompanying these sepcimens states that they were found in a swamp and are very common. Two measure 80 x 12 and 52 x 7 mm. respectively. The larger with well-marked clitellum covering fifteen small annuli and extruded filiform penis; the smaller without indications of sexual maturity. Both are very dark —nearly uniform slaty-black above with very distinct white sensillæ, brownish-gray below heavily mottled with black.

"Pond at Cheticamp, Cape Breton Island, July 1, 1917. F. Johansen." One.

"Pond on fields at Moose Factory, Ontario, July 14-15, 1920. F. Johansen." Three specimens, one of large size, two thickly, one sparingly blotched.

"Missinaibi River, Ontario (between Mattice and Opazatika River), June 24, 1920. F. Johansen." Two small specimens.

"Abitibi River, Ontario (between New Post and Moose River), middle of October, 1920. F. Johansen." One small specimen.

"Government River Post, Albany River (at lat. 51 30 N.), August 16, 1920. M. Y. Williams." One specimen.

"Brook near Ottawa, Ontario, June 30, 1918. F. Johansen." A young specimen 11 mm. long with the clitellum already developed. The female genital orifice is one annulus further forward than usual, being therefore removed from the male orifice by only four annuli.

"Pickwick Lake, north of Thurso, Quebec, June, 1903. A. Halkett." One thickly and finely mottled with black.

"Long Lake, north of Lake Superior, Ontario, August, 1916. F. W. Waugh." One heavily blotched.

"St. Joseph Island, Sault Ste. Marie, Ontario, September 3, 1918. F. Johansen." One of a dark slate color above, paling at the margins into the bluish-white of the venter. Dorsally are a few very conspicuous scattered irregular pale spots.

"Island Lake, Algonquin Park, Ontario, July 17, 1900. W. Spreadborough." One.

"Probably from lakes in Alberta and Saskatchewan, 1894. John Macoun." A fine specimen, notable for the almost complete loss of the usual secondary dividing furrows on the enlarged annuli vii *a* 3 and vii *a* 1. With one *H. grandis*.

"On Dore, Qu'Appelle Valley, Saskatchewan, summer, 1907. A. Halkett." One.

"Near Beaver Lake, Alberta, summer, 1907. A. Halkett." Three.

"In warm sulphur water, Vermillion Lakes, Banff, Alberta, coll. 17- VII-16. C. G. Hewitt." One.

"A. N. S. No. 3398, Kingston, Ontario, October, 1915. A. B. Klugh. Under stones."

"A. N. S. No. 3399, Lake Ontario, October, 1915. A. B. Klugh."

"A. N. S., No. 3457, Prince Edward Island, August 24, 1912. Bayard Long."

The wide range and general distribution of this species across the entire east and west width of Canada is evident from the above series. When the color is not mentioned it is the typical dark blotched pattern on a paler background. The green pigments of the living leech are lost upon preservation. The *H. sanguisuga* reported from Newfoundland by Blanchard is probably this species.

(To be continued)

PROSECUTIONS

Migratory Birds Convention Act and Northwest Game Act, by Officers of the Dominion Parks Branch and Royal Canadian Mounted Police.

MIGRATORY BIRDS CONVENTION ACT.

REPORTED DURING THE PERIOD—MAY 19, 1921—OCTOBER 24, 1921.

Willard Jordan, Murray Harbour, Prince Edward Island. Attempting to kill a Brant in close season. Fine $10.00 and costs.

Simon Jordan, Murray Harbour, Prince Edward Island. Attempting to kill a Brant in close season. Fine $10.00 and costs.

Willard Crook, Cape Traverse, Prince Edward Island. Killing a Canada Goose in close season. Fine $10.00 and costs.

Alex. Boudreau, Esquimaux Point, Quebec. Having in possession Eider Ducks in close season. Dismissed.

Alfred Boudreau, Esquimaux Point, Quebec. Having in possession Eider Ducks in close season. Dismissed.

Louis Bariau, Esquimaux Point, Quebec. Having in possession Eider Ducks in close season. Dismissed.

Brent Eisenhauer, Indian Point, Lunenburg County, Nova Scotia. Shooting at Ducks out of season. Dismissed.

Allison Johnson, Mahone Bay, Lunenburg County, Nova Scotia. Shooting at Ducks in close season. Fine $10.00 and costs.

Hector Landry, Durlingville, Alberta. Shooting one Green-winged Teal in close season. Fine $10.00 and costs.

Merritt Brown, Grand Harbour Rd., New Brunswick. Killing Black Duck in close season. Fine $10.00 and costs.

John Harvey, Seal Cove, Grand Manan, New Brunswick. Taking Gulls' eggs. Fine $10.00 and costs.

Hatsel Cronk, Little Wood Island, Grand Manan, New Brunswick. Taking Gulls' eggs. Fine $10.00 and costs.

Bruce Stanley, North Head, Grand Manan, New Brunswick. Taking Gulls' eggs. Fine $10.00 and costs.

Peter Stanley, North Head, Grand Manan, New Brunswick. Taking Gulls' eggs. Fine $10.00 and costs.

John Johnson, North Head, Grand Manan, New Brunswick. Taking Gulls' eggs. Fine $10.00 and costs.

Fulton Fleet, Seal Cove, Grand Manan, New Brunswick. Molesting migratory game birds in close season. Fine $10.00 and costs.

Robert Green, Seal Cove, Grand Manan, New Brunswick. Molesting migratory game birds in close season. Fine $10.00 and costs.

Coleman Green, Seal Cove, Grand Manan, New Brunswick. Attempting to kill migratory game birds with the use of a power-boat. Fine $10.00 and costs.

Robert Green, Seal Cove, Grand Manan, New Brunswick. Attempting to kill migratory game birds with the use of a power-boat. Fine $10.00 and costs.

Coleman Green, Seal Cove, Grand Manan, New Brunswick. Molesting game birds in close season. Fine $10.00 and costs.

Coleman Green, Seal Cove, Grand Manan, New Brunswick. Wilfuily furnishing false information to a game officer. Fine $10.00 and costs.

W. R. Wadsworth, C.P.R. Building, Toronto, Ontario. Shooting a Semipalmated Sandpiper. Fine $10.00 and costs.

Lionelle Raymond, St. Denis de Kamouraska, Quebec. Having in possession a Semipalmated

Sandpiper. Fine $10.00 and costs. Suspended.

John McCarthy, Killarney, Manitoba. Shooting Blue-winged Teal in close season. Fine $10.00 and costs.

W. Woods, Killarney, Manitoba. Shooting Blue-winged Teal in close season. Fine $10.00 and costs.

Dame Onesime Despres, 148 St. Bernard St., Quebec, Que. Having in possession one live Bobolink. Withdrawn.

Wm. Francis Slade, Westmount, Quebec. Illegal possession of Semipalmated Sandpipers. Fine $10.00 and costs.

Wm. Townsend, Grand Pre, King's County, Nova Scotia. Molesting Semipalmated Sandpipers by discharging a gun with intent to kill. Fine $10.00 and costs.

J. V. Welsh, Turtle Tank, Mine Centre, Ontario. Having a migratory game bird, viz: plover, in his possession without lawful excuse contrary to sec. (6) of the M.B.C.A. Fine $10.00 and costs. Seizure: one shot-gun.

R. Paquet, Magog, Quebec. Having in possession one Great Blue Heron. Fine $10.00 and costs.

H. A. Channell, East Bolton, Quebec. Having in possession one Grebe. Fine $10.00 and costs.

Fred Mitchell, Sherbrooke Quebec. Having in possession one Wood Duck. Fine $10.00 and costs.

Henri Menard, Eastman, Quebec. Having in possession two Mergansers in close season. Fine $10.00 and costs.

Henri Menard, Eastman, Quebec. Having in possession one Great Blue Heron. Withdrawn.

Harry E. Reid, Windsor, Nova Scotia. Having in possession one Great Blue Heron. Fine $10.00 and costs.

E. J. Hibbert, Chipman's Corner, Nova Scotia. Hunting Woodcock in close season. Fine $10.00 and costs.

H. Whittier, R.R. No. 2, Magog, Quebec. Having in possession one Great Blue Heron. Fine $10.00 and costs.

H. J. Placey, 17 Wellington St., S., Sherbrooke, Quebec. Having in possession one Loon. Fine $10.00 and costs.

John Murphy, New Minas, King's County, Nova Scotia. Having in possession Semipalmated Sandpipers in close season. Fine $10.00 and costs.

NORTHWEST GAME ACT PROSECUTIONS.

R. W. Phillips, Victoria Island, Northwest Territories, Violation of Section (6) of the Regulations under the Northwest Game Act, which prohibits hunting and trapping, except by Eskimos, on Victoria Island, Northwest Territories—A fine of $100.00, without costs was imposed, or, in default, two months imprisonment with hard labour at Fort McPherson. The accused being destitute the warrant of committment was suspended on condition that the accused leave the Territory by the first steamer. Accused left the country. Seizure: Three White Fox skins.

George Komana, Kittigaruit, Northwest Territories, Trapping Fox out of season. Fine $50.00. Seizure: Two White Fox skins.

ADDITIONAL NOTES ON THE WINTER BIRDS OF THE OKANAGAN VALLEY, BRITISH COLUMBIA

BY J. A. MUNRO, OKANAGAN LANDING, BRITISH COLUMBIA.

Since the publishing of a list of the winter birds of the Okanagan Valley in 1917*, a number of additional records have been made which may be of some interest. In the list referred to, annotations were given on one hundred and ten species and sub-species known to occur during the winter months, and, with the additions here recorded, the list is increased to one hundred and twenty-two. Winter is defined for the purposes of this paper as being between November 1st and March 1st inclusive.

LONG-TAILED DUCK: *Harelda hyemalis.* An adult male shot in Bissett Creek near Lumby on November 15th, 1918, was brought to the local taxidermist. This species is known as a scarce and irregular migrant.

CANADA GOOSE: *Branta canadensis canadensis.* At Vaseaux Lake on December 22nd, 1920, I heard honkers flying over and was told by the residents that they winter regularly in this section.

VIRGINIA RAIL: *Rallus virginianus.* An adult female in my collection was taken at Summerland on December 22nd, 1919.

PRAIRIE FALCON: *Falco mexicanus.* A young male was taken at Okanagan Landing on November 6th, 1921.

GRAY GYRFALCON: *Falco rusticolus rusticolus.* A specimen of this rare falcon was taken at Kelowna on December 1st, 1916, and is now in the collection of Mr. L. E. Taylor.

*The Ottawa Naturalist, XXXI, pp. 81-89.

SPARROW HAWK: *Falco sparverius.* A second winter record for this species was made on February 17th, 1919.

LEWIS' WOODPECKER: *Asyndesmus lewisi.* During the winter of 1920-21 two of these birds were seen near Kelowna by several persons who described them to me. I had seen one in that locality on October 23rd, 1920—a notably late record as they usually leave during the last week of August.

HOYT'S HORNED LARK: *Otocoris alpestris hoyti.* On December 5th, 1918, I took an example of this race from amongst a large flock of *arcticola.* This specimen is now in the Brooks collection.

RUSTY BLACKBIRD: *Euphagus carolinus.* On December 5th, 1918, three Rusty Blackbirds accompanied by two Killdeer were seen on the lake shore at Okanagan Landing, and two specimens were taken, establishing a new record for the Okanagan Valley. Two other specimens were taken on November 13th, 1919. Prior to this the Rusty Blackbird had been recorded from the following localities in British Columbia, namely Edgewood, Metlakatla and Atlin. In a discussion of the status of this species in British Columbia with Mr. H. S. Swarth, he informed me that he found them breeding commonly near Hazelton during the past summer (1921).

BREWER'S BLACKBIRD: *Euphagus cyanocephalus* In my former list, I stated that large numbers of Brewer's Blackbirds wintered in the City of Kelowna during 1912-13, but that none had been seen north of this. During the winter of 1917-18 a flock of twenty remained in the creek bottom between Okanagan Landing and Vernon. They were frequently seen following the rooting operations of a drove of pigs which were ranging over some newly ploughed land.

CASSIN'S PURPLE FINCH: *Carpodacus cassini.* Prior to 1917, winter records for this species were uncommon, but since then their appearance has been more regular. During the winter of 1920-21 they were quite common, a flock of forty being seen on January 24th.

WHITE-WINGED CROSSBILL: *Loxia leucoptera.* Specimens were taken on November 29th, 1919, at Okanagan Landing. These were associated with bands of American Crossbills which are much more numerous and of more frequent occurrence than *leucoptera.*

REDPOLL: *Acanthis linaria linaria.* Formerly an abundant winter resident arriving early in November and remaining until the latter part of March. None were seen after the winter of 1916-17 until the present year (1921), when a single bird was noted amongst a flock of Juncos on December 19th. On the following day a flock of twelve were seen and these are still in the vicinity at the time of writing (December 22nd, 1921).

CEDAR WAXWING: *Bombycilla cedrorum.* Two Cedar Waxwings were seen on numerous occasions from December 28th, 1920, until the following spring. This record is notable in that this species leaves early in September and is one of the last migrants to arrive in the Spring.

ROCKY MOUNTAIN CREEPER: *Certhia familiaris montana.*

SIERRA CREEPER: *Certhia familiaris zelotes.*

Apparently these two races occur in equal proportion during the winter. *Zelotes* as compared with *montana* is considerably smaller, decidedly more brownish on the upper parts and with a relatively shorter bill.

I am indebted to Dr. Louis B. Bishop for the identification of specimens.

CHESTNUT-BACKED CHICKADEE: *Penthestes rufescens rufescens.* A small band was found near Rollings Lake, twenty miles northeast of Vernon in December, 1918.

WESTERN BLUEBIRD: *Siala mexicana occidentalis.* This species is becoming a regular winter resident; a small flock has been seen each year since first recorded in 1916.

ORNITHOLOGICAL OCCURRENCES AT TORONTO, ONTARIO, JANUARY, 1922

BY STUART L. THOMPSON.

Toronto and the surrounding country has seen several unusual records of bird life this winter. The weather, although cold at times, was often very mild, the temperature going above freezing and there being an unusual lack of snow. The city streets have been quite bare and many hillsides throughout the country still show the frozen earth and dead leaves of the fall. This lack of snow on certain hillsides is not due to its having melted so much as to the fact that there have been several days of strong winds which tended to drift the snow onto some places more than others. No days warm enough to cause buds to burst have occurred and rainy days have been very few The Don and Humber Rivers have both been solidly frozen over except in swifter parts and Toronto Bay has been more or less open in patches.

There were reports from northern woods to the effect that the usual crop of bird foods—seeds, berries, etc.—was poor, which led many of us to be on the watch for some of the irregular and rare winter visitants, such as Pine and Evening Grosbeaks, Redpolls, Canada Jays and Snow Buntings. As early as November some of these appeared. Snow Buntings and Canada Jays were both seen at Scugog Lake on November 7, while I was hunting ducks, and a week later Pine Grosbeaks were seen at the Humber River. During December I saw several flocks of Redpolls in the Don valley, but at no time were any Canada Jays seen in the vicinity of Toronto. Other rather unusual visitants this winter were a pair of Cardinals, which were seen feeding on berries on December 18 in the Humber valley. The same day a Belted Kingfisher was seen—rather a late date. With these unusual late records an interesting winter seemed in view. Taking advantage of every opportunity, I went out early every Sunday morning and some of the results were most gratifying, considering that often the weather at the time was very uninviting. Although little snow was flying and there were probably not more than 5° or 10° of frost, the strong western winds which blew made ornithological work endurable only in sheltered ravines or deep woods.

Week by week, my records are as follows:

January 1.: Downy Woodpecker, Tree Sparrow, Song Sparrow, Chickadee.

January 8.: Great Black-backed Gull, Ring-billed Gull, American Scoter, Hairy Woodpecker, Junco, White-breasted Nuthatch.

January 15.: American Merganser, Scaup Duck, American Golden-eye, Red-headed Woodpecker, Northern Shrike.

January 22.: Red-breasted Merganser (?), Sparrow Hawk, Brown Creeper.

January 29.: Saw-whet Owl, Evening Grosbeak, Swamp Sparrow, Robin.

In all, 22 species were seen in January. Besides *seeing* these, I have heard Pine Grosbeaks, a Screech Owl, Blue Jays and Redpolls, without being able to locate them at the time. Many of these birds seen are, of course, regular winter visitants or permanent residents, whose presence is expected almost any day in winter. Strange to say, I have not, throughout the whole month, either seen or heard a Crow. On other winters I have noted great flocks of Crows, even on January 1.

The more interesting notes on the species observed are as follows.

SONG SPARROW. Rarely stays all winter. I found a dead specimen in the winter of 1905 and saw one alive on February 6, 1921. This year, however, I have found the Song Sparrow once at the High Park marsh and once in the Don valley; apparently quite cheerful.

SPARROW HAWK. This bird was seen perched on a dead branch of a pine tree on the lee side of a residence near High Park. There was a high wind blowing at the time and he seemed very loth to take flight, so that we came quite close to him. Finally he flew off through the park, when his typical flight could not be mistaken.

RED-BREASTED MERGANSER. I must admit being doubtful of this identification. As I was strolling through the Don valley, I came upon a pair of these birds who took flight at once. They had been feeding in a small open part of the river, where the rapid current kept a few yards unfrozen. I had no difficulty in recognizing them as Mergansers, not only by their plumage, for, on account of my coming up under cover of a steep bank, I came within about 30 yards of them, but also by the manner in which they made a wide circle and flew down the valley again directly over my head, when their thin, narrow bills were quite readily seen.

SWAMP SPARROW. This bird was found in company with a flock of Tree Sparrows who are to be seen in a frozen marsh in High Park throughout the winter. I was first attracted to him by his note—so different from any which the Tree Sparrows were uttering at the time. On my approach the Tree Sparrows moved to the other side of the marsh, but this particular stranger sought cover and remained skulking from clump to clump until finally, after many fleeting glances through the reeds, he showed himself plainly on a twig, when he was readily identified. The Song Sparrow mentioned previously was seen near here also.

ROBIN. Plainly seen on a sunny hillside near the Humber, foraging about on the bare ground. He uttered his call and was apparently in good condition and plumage.

RED-HEADED WOODPECKER. Three of these birds have been seen at one time in High Park. Several times people have mentioned seeing one where I saw my three. On another occasion, I saw one about a mile away. It seems hardly likely that this is one of the three, for at no time did any fly very far. Seemingly they all preferred to remain quiet and, on windy days, cling to the lee side of tree trunks as I watched them.

EVENING GROSBEAK. A flock of eight were seen eating Manitoba maple seeds in the Humber valley. None were seen elsewhere, although they were reported in various parts of the city.

As for Ducks, American Mergansers, and Gulls, they all were seen in Humber Bay. Although the

river is frozen over, its mouth and the bay are still open. The city has built a long concrete breakwater along the water-front, about 50 or 100 yards from shore. This forms a lagoon which in milder weather is open and which is protected from the open lake's waves and so is an ideal resting spot for water birds.

Many times I have seen Great Black-backed and Ring-billed Gulls resting on the concrete wall where they were easily seen through field-glasses. On several occasions I have seen what I believe to be the same flock of American Mergansers feeding and sporting in the quiet lagoon. Generally there are two males and three females. On January 29 a fourth female appeared. All permitted a very close approach, but the one female did not follow the rest in flight. Later we saw her distinctly at a distance of a few yards, for she dived and came up close to us by the pier at the mouth of the river. There are generally several Golden-eyes here also, very tame, for people are often seen crossing Humber Bridge at this point. Once a small flock of Scaup Ducks were here and on another occasion I identified an American Scoter. I have never yet been sure of the identity of large flocks of ducks which I see farther out on the lake, but the Long-tail (Old-Squaw) is an abundant visitant here in some winters. It is probable that these flocks are Long-tailed Ducks.

NOTES AND OBSERVATIONS

THE STARLING, *Sturnus vulgaris*, AT TORONTO, ONTARIO

The following note from my diary has been held, till confirmatory records of the Starling as an Ontario bird appeared. The date was August 24, 1920.

"While in my garden (Rusholme Road) about 7.30 this morning, watching for migrants, I saw a flock of seven birds fly west over the garden, and pass out of view, just clearing some tall elms across the road. I was at the east end of the garden when the birds were first seen directly above me, and I was able to watch them for nearly three hundred feet of their flight, and instantly decided they were English Starlings; the shape of the birds, their flight, and the movements of the flock were characteristic; and I had no doubt, while the birds were in sight, of their identity."

J. H. FLEMING.

YOUNG WEASELS

At Bella Coola, British Columbia, on June 18, 1921, my attention was called by Master Wilfred Christensen and his playmate, Master Donald Morrison, to two shivering young weasels which they had found under some boards filling a shallow waterway across a wood road. They said a parent weasel had carried off a third kitten weasel, and they were keeping both parents away by flourishing sticks. Both parents were continually rushing out and retreating. After examining the kittens, which had bodies about five inches long, we all stepped back perhaps fifteen feet and waited quietly. Soon we heard the chirping cry of one parent weasel as it ran out, looked at us, dodged around a stump, and looked at us again. It then rushed to the young weasels, seized one, apparently by the ear, but possibly by the neck or head, and whisked it away out of sight under the boards and brush. In a few moments it returned and removed the other slightly larger kitten weasel in the same manner. The old weasel seemed smaller in girth than the kitten, but this may have been an illusion caused by the slenderness of the adult.

HARLAN I. SMITH.

DISEASED SHARP-TAILED GROUSE IN MANITOBA.

During the hunting season for grouse in Manitoba—October 15 to 22, 1921—thirty examples of the Prairie Sharp-tailed Grouse (*P. phasianellus campestris* Ridg.) were shot near the writer's home at Aweme. On being prepared for cooking two of these birds were found to be very thin and a post-mortem examination revealed the fact that the liver was severely affected by tuberculosis of a nature apparently identical with that found in domestic poultry. Whether the disease is really as prevalent as these examples indicate cannot, at present, be told, but in any case the presence of such a disease in one of our most valued game birds is a matter of considerable importance as it may well prove one of the chief factors in retarding the bird's increase. The disease may be spread in several ways, but it would probably make its greatest progress during the "dancing" period in spring time, when the males gather on certain small areas, or in Autumn, when the birds often collect into large flocks.

NORMAN CRIDDLE.

THE ANNUAL MEETING OF THE AMERICAN ORNITHOLOGISTS' UNION

The thirty-ninth Stated Meeting of the American Ornithologists' Union was held in Philadelphia,

November 7th to 12th, 1921, An unusually large attendance was present.

The business meeting was held the afternoon and evening of November 7th, when a "Shore Dinner" was given by the President of the Union to the Fellows. Amongst the Members raised to the Fellow class was our countryman, Major Allan Brooks, of British Columbia. A large number of Canadians were elected Associates.

Public meetings given to the reading and discussion of papers occupied the 8th to 10th. The Annual Dinner was celebrated the evening of the 9th and on the 11th and 12th opportunity was given to visit the Zoological Gardens and points of historical and ornithological interest near the city.

One paper on Canadian ornithology was read: "Some Breeding Birds of Saskatchewan," by Mr. Geo. H. Stuart, who visited the vicinity of Crane Lake last summer.

Much of the pleasureable success of the meeting was due to the hospitable welcome extended by the various members of the Delaware Valley Ornithological Club and by the Academy of Natural Sciences, which threw its doors wide open to the Union and in whose halls the meetings were held.

Among those present were: Messrs. Edward Arnold, Montreal; J. H. Fleming, Toronto; Hoyes Lloyd, Ottawa; W. E. Saunders, London; P. A. Taverner, Ottawa.

One visitor from England was present, H. Kirk Swann, who is visiting American ornithologists for the purpose of obtaining material for his Synopsis of the Accipitres, now in course of publication.

The next Annual Meeting will be held in Chicago.

LECTURES TO SCHOOL CHILDREN

During the winter of 1920 to 1921, the Victoria Memorial Museum re-established the old policy of providing a course of lectures for the entertainment and instruction of the school children who throng the building every Saturday morning. Many members of the museum staff offered their services for these lectures, and the Department of Trade and Commerce co-operated by providing moving pictures and an operator. In consequence, every lecture was illustrated with lantern views, and all but one with moving pictures as well; at this one living animals were presented. So popular did the lectures prove that they had to be repeated each morning to a fresh audience, as the hall, which has a seating capacity of 562, was not large enough to accommodate the crowds. In fact one lecture had to be given three times in the same morning.

The following is the programme of the lectures; a similar programme has been arranged for the winter of 1921-22.

Feb. 12.—"The Fur Bearing Animals of Canada." By C. L. Patch.

Feb. 19.—"The Birds of Bonaventure Island." By C. L. Patch.

Feb. 26.—"The Canadian Arctic Coast." By K. G. Chipman.

March 5.—"Wanderings with the Eskimos." By D. Jenness.

March 12.—"Roads to Wealth in Our Northern Forest, or Mineral Development in Northern Ontario." By T. L. Tanton.

March 19.—"Hunting Giant Dinosaurs in the Badlands of Alberta." By Charles M. Sternberg.

March 26.—"Ottawa Three Times Submerged and How We Know It." By M. E. Wilson.

April 2.—"Conquering the Desert with Irrigation." By Harlan I. Smith.

April 9.—"Asbestos or Fire Proof Cotton." By R. Harvie.

April 16.—"My Summer Among the Ojibwa Indians." By F. W. Waugh.

April 23.—"The Frogs, Salamanders and Snakes of Ottawa." By Clyde L. Patch.

STRANGE ACTIONS OF A DUCK.

While on the North Shore of the Gulf of St. Lawrence in the summer of 1921, I witnessed what was to me very surprising behavior on the part of a wild duck.

The first occasion was at Natashquan, in the month of June, where I was then tenting with Harrison F. Lewis, Chief Federal Migratory Bird Officer for Ontario and Quebec.

The bird first attracted our attention by flying in circles over the harbor and shore quite near our tents, uttering a succession of low maternal quacks as it did so. While watching it, we saw it make several attempts or feints at alighting on the Government Wharf quite near us. We thought it was an American Golden-eye, though the total absence of the whistling sound made by the wings of this species when in flight as well as the subdued character of its distinctive markings made it somewhat of a puzzle, to me at least. After it had flown away we searched the rocks and barren in the vicinity for tree or stump where its nest might be, but without success.

On a day following, I was startled by the same bird flying down past me from off a warehouse built on the wharf, but as it was in flight before I saw it I could not locate its exact perch.

A couple of days later we embarked in the mail-boat to continue our journey along the coast but

were held at the wharf for a time by unfavorable wind and weather. While here, Mr. Lewis went one morning for a trip on shore, leaving me with the mail-carrier, Mr. Fred Jones, and his son, "Len."

As I had a very lively interest in the bird I had been watching, I asked my companions if they had noticed it. They stated that they had seen such a bird for several seasons in succession. and that it often alighted on the chimneys and roofs of the houses on shore. A few minutes after this conversation I was hailed from the deck by the boy, who announced, "Here is your duck now." Taking my field glasses I went on deck, to find the bird sitting on the ledge of a small window well up in the gable end of the warehouse at the farther end of the wharf. As the day was somewhat misty, I landed on the wharf and approached to about one hundred feet from where it sat. At this distance by the aid of the glasses my observation was about all that could be desired. From where I stood I could see the reflection of the bird in the glass of the window almost as plainly as I could see the bird itself, and it seemed to be this reflection that occupied the whole attention of Madam Duck herself. After a few moments she arose from her sitting position to her full height and seemed to be peering into the window and bobbing her head in an endeavor to establish friendly relations with her own shadow. The approach of some men along the wharf caused her to fly away and again I noticed the noiseless flight, though I had quite made up my mind that it was a female Goldeneye.

In the following month I was one day talking with two of the patients on the verandah of the Grenfell Mission Hospital at Harrington, and as usual the conversation was chiefly of the birds of the coast. I described the bird seen at Natashquan and asked them if they had ever seen one like it. They replied that they had, from their seat on the verandah, watched one nearly every day for weeks past and that they had seen it that morning. One of its usual performances, as described by them, was to visit the Episcopal Church adjacent to the Hospital to circle around the chimney, sometimes perching on it and sometimes for a short space disappearing into the opening. From their accurate description of the bird and its actions, I felt that they were stating facts. I asked them what they called this particular duck, and they replied that it was a "Smoky Pie" and they were greatly surprised that I did not know a duck of that name.

J. L. DE VANY.

CORRESPONDENCE

To the Editor of the Canadian Field-Naturalist:

Dear Sir:

I was much interested in the Note by Mr. Hoyes Lloyd in the May, 1921, number of *The Canadian Field-Naturalist* on "An Aquatic Habit of the Pigeons" and am able to add other instances of the habit. To quote my "Notes on the Rock Dove" (Auk, XXXII, 1918, p. 315) "Saunders (Manual of British Birds, 1889) says 'both wild and tame Pigeons have been seen to settle on the water like Gulls and drink while floating down stream.' Mr. Wm. A. Jeffries tells me he once saw a Pigeon alight on the surface of the Frog Pond in Boston Common. I have seen a Pigeon hovering above Charles River in Cambridge dropping its feet till they touched the water, picking up something with its bill. This was repeated five or six times."

In my "Bird Genealogy" (Auk, XXIX, 1912, pp. 288, 289) in a study of the relationship of the pigeons to the auks, gulls, and plovers in the group of Charadriiformes, I state that "I recently placed a half-grown Domestic Pigeon in a washtub of tepid water. With head and neck erect, the bird swam rapidly with alternate strokes of the feet to the side of the tub. The wings were arched up and waved slightly—not stretched out and flapped in the water as in the case of young Passerine birds. Its position was like that of a Duck, but low in the water. Progress was much more rapid than on land where the bird stumbled awkwardly along. Indeed it had never before left the nest. I repeated the experiment several times with the same result. A fact of considerable interest in this connection is that 'A Pigeon with a perfectly webbed foot [was] evolved at Cambridge by only three years' selected crossings' (T. Digby Pigott, 'London Birds and Other Sketches,' London, 1902, p. 239). This may be looked upon as a case of reversion."

In answer to Mr. Lloyd's question, therefore, I should say: This curious habit of alighting on the water has not been acquired independently, but has an ancient foundation.

CHARLES W. TOWNSEND.
Nov. 30, 1921. 98 Pinckney St., Boston

THE WILLET IN WESTERN NOVA SCOTIA

Editor, Canadian Field-Naturalist:

Sir:

It is with very great pleasure and interest I note the increase of that splendid shore bird, the Willet. My first remembrance of him was some forty years ago, when, a mere kid, I was tenting on the beach of St. Mary's Bay, in Digby County, Nova Scotia. My companion was a sportsman of note at that time. Our object was the shooting of

Black-breasted and Golden Plover. It was my first Plover-shooting trip and I recall that Golden and Black-breasted Plover were plentiful. A flock of sandpipers flew past my blind and among them I noticed a big bird with white stripes in his wings. The big bird fell at the report of my muzzle-loader. My shooting companion called it a "White Wing." We saw during our trip of four days some five or six of these big Willets. In those days of blessed memory they were scarce along St. Mary's Bay, and never in my recollection were Willets so plentiful as at the present time. Seven years ago I noticed with interest that Willets were nesting in Digby County. Since that time there are more of these birds nesting here each year, and more especially since the elimination of spring shooting can the increase be noticed. At the present time (June 18th, 1921) many birds are nesting at Little River Harbour, Yarmouth County, Villagedale, Shelburne County, and Grossecoques, Digby County. There are doubtless other places in western Nova Soctia where these birds nest. Willets are about the first of the large "Shore Birds" to leave us in the fall, and by September first not many remain here. Under the *Migratory Birds Act* these birds are protected. It is, however, a difficult matter to protect them fully, as only a comparative few of the present day shore bird shooters really know them at a glance. Of course the white of their wings is very distinctive, but during the month of August the coast-line where these birds are is very often obscured with fog and when a bunch of these large birds burst through the fog-mull it is difficult for the amateur to distinguish them in a second or so and decide they are on the "protected list." Willets are the easiest of the Shore Birds to decoy and "whistle" within shot (with the possible exception of the Yellow Legs).

They are, however, increasing very fast, much to the joy of all true sportsmen. Only yesterday I was among the nesting Willets. There was a real colony of them. They are very noisy birds at this season, and so bold they will nearly fly against one as you walk near their nesting grounds. Their constant cries of *Ca-luck, Ca-luck, Tee-da, Tee-da* still ring in my ears. There will be hundreds of young birds ready for the fall migration next August. Let us hope that not many of them will be mistaken for legal game during their flight and that all shooters will "have a care." I have never known so many Willets to nest in Digby County as there are this spring. If the increase continues at the present rate there will be little danger of this grand bird becoming extinct as was feared a short while ago.

H. A. P. SMITH, DIGBY, N.S.

Editor, The Canadian Field-Naturalist:

Dear Sir:

Having noticed in the issue of September last under "Notes and Observations" a reply by Harrison F. Lewis to a short article of mine on "The Birds of the Wilderness of Nova Scotia," I would say that Mr. Lewis' criticism of my notes as they appeared under the heading in *The Naturalist* is not far astray. My notes referred, however, to song birds alone, and should have been printed as the copy read, viz., "The Absence of Song Birds in the Wilderness of Nova Scotia." I may further say that if Mr. Lewis will *go back* into the interior of this province he will not fail to notice the scarcity of song birds; I do not mean the short trips usually taken by the trout fisherman, but back to the top of the watershed. I may further say that he will not there find the White-Throated Sparrow as he suggests. This bird is to me the finest song bird we have, and I am always on the alert to catch his pure notes. Neither will Mr. Lewis discover the Maryland Yellow-throat, nor the Chestnut-Sided Warbler. As far as Loons, Ruffed Grouse, and Blue Herons are concerned, they are certainly to be found there, but it would be most difficult to strain one's imagination enough to call them song birds. Mr. Lewis' mention of Herring Gulls proves to me that he has not been to the real wilderness of Nova Scotia, as these birds are seldom found so far from salt water in this province. Mr. James W. Stuber, Assistant Chief, Bureau of Fish and Game of Ohio, noticed this absence of song birds during his trip to the interior of the province. Writing in the *Sportmsan's Review*, he says, "'The silence was profound. Not a bird twittered." I have also read, in the same September number of *The Naturalist*, Mr. Lewis' article, "Among the Coffin Carriers," referring to the colony of Black-Backed Gulls at Lake George, Yarmouth County. As Mr. Lewis is now in Labrador, it will be of interest to know whether upon his return he will retain the same respect and love for this big gull that he carried with him into Labrador. Perhaps he may let us hear about it through *The Naturalist* when he gets back.

H. A. P. SMITH, DIGBY, N.S.

BOOK NOTICES

"LIFE HISTORIES OF NORTH AMERICAN DIVING BIRDS" (1919) and "LIFE HISTORIES OF NORTH AMERICAN GULLS AND TERNS" (1921), by Arthur Cleveland Bent. These two volumes, which are Bulletin 107 and Bulletin 113, respectively, of the United States National Museum, are a continuation of the series of "Life Histories" begun by the late Major Charles E. Bendire.

The systematic and thorough manner in which the life histories of the species dealt with are set forth is indicated by the following quotation from the Introduction to the "Life Histories of North American Diving Birds":

"After a few introductory remarks where these seem desirable, the life history of each species is written in substantially the following sequence: Spring migration, courtship, nesting habits, eggs, young, sequence of plumages to maturity, seasonal molts, feeding habits, flight, swimming and diving habits, vocal powers, behavior, enemies, fall migration, and winter habits. An attempt has been made to avoid repetition in dealing with subspecies."

The task which the author has thus outlined for himself has, in general, been well performed. Previous publications have frequently been drawn upon for essential data and apt passages so that the volumes summarize the knowledge already available in this field. Much original matter has also been contributed, both by the author himself, who has travelled far and wide to study North American birds in their homes, and by a host of other ornithologists, who have furnished notes and data on particular points. Although the volumes thus present admirable and strictly up-to-date accounts of the life histories of the species considered, this serves to emphasize the fact that our knowledge of the life histories of many species is very unsatisfactory. Little or nothing is known about the place and manner of the nesting of several species, such as the Marbled Murrelet and the gray-winged gulls (Kumlien's and Nelson's). There is a very great deal for students of avian life histories yet to accomplish.

An important addition to the text in the second volume is information regarding reservations and the species which are protected in them. This information hardly does justice to Canadian reservations established under the *Migratory Birds Convention Act*, but this may be due to the fact that the manuscript for this volume was completed a considerable time before the volume was published.

Several of the life histories in each volume are contributed by Dr. Charles W. Townsend.

The illustrations form a most pleasing and valuable feature of these publications. Abundant half-tone plates, depicting chiefly birds and birds' nests in their natural surroundings, are scattered through the text. Special colored plates, showing in their actual sizes one or more typical eggs of every species dealt with whose eggs are available, are bound in each volume. These are of a very high quality, especially those in the volume on the Gulls and Terns, which are on egg-shell paper and are beautiful examples of their kind.

The author defends the Loon against persecution, thus furnishing justification for the legal protection now accorded to Loons in Canada and the United States under the *Migratory Birds Convention.* Speaking of the fact that the Loon's diet of fish includes trout, he says, "Some sportsmen have advocated placing a bounty on loons on this account, but as both loon and trout have always flourished together until the advent of the sportsmen, it is hardly fair to blame this bird, which is such an attractive feature of the wilds, for the scarcity of trout. We are too apt to condemn a bird for what little damage it does in this way, without giving it credit for the right to live." With these statements, which are capable of a wide general application, the reviewer is in hearty agreement.

Mr. Bent speaks of the much-discussed soaring flight of Gulls, saying "To my mind it is simple enough to understand, if we can realize that a gull is a highly specialized, almost perfect sailing vessel, endowed with instinctive skill in navigating the air to use the forces at its command to advantage. With a clear knowledge of the forces at work when a ship sails, close hauled, to within a few points of the wind, we can imagine the gull sailing along a vertical plane, in which the force of gravity replaces the resistance of the water against the keel and the wind acts against the gull's wings as it does on the sails of the ship; the resultant of these two forces is a forward movement, which the gull controls by adjusting its center of gravity and the angle of its wings."

Although this analogy is plausible at first glance, it will not stand investigation. There is a radical difference between the action of the force of gravity upon a soaring bird and the action of the resistance of the water against the hull and keel of a vessel sailing close-hauled. The resistance of the water against a vessel always acts directly to consume the component force making for leeway, whereas the force of gravity acts upon the bird's mass in a fixed direction, at right angles to the force exerted by a horizontal current of air. It therefore cannot prevent leeway, and, however, the force of a horizontal wind may be divided into components by the position of the soaring bird's wings and body, the ultimate resultant of those components must be such as to cause the bird to move to leeward, not to windward. This fact can be demonstrated readily by means of the usual formal diagrams indicating resolution of forces, the reproduction of which here would exceed the limits of this review.

The true explanation of the undeniable fact that Gulls and other birds do soar against the wind

without loss of elevation must be sought elsewhere. No satisfactory solution of the problem has yet been made public. It will be sufficient to point out here that one of the best authorities on the subject, Dr. E. H. Hankin, in his recent work on "Animal Flight" (Iliffe & Sons Ltd. London, 1913[?]), states (p. 59) that "In other words, in attempting to discover the source of the energy of soaring, the movement of tangible masses of air that we know as wind must be left out of account." and presents an abundance of carefully recorded observations in support of his statement. Neither superficial observations nor hasty conclusions will solve this important question of soaring flight.

Several minor errors which these two volumes contain may well be corrected here, lest they persist as truth.

The most southerly breeding station of the Puffin is given (p. 89) as Matinicus Rock, Maine, although Macoun's breeding record (1909) for this species at Seal Island, Yarmouth County, Nova Scotia, is referred to on the same page. Seal Island is farther south than Matinicus Rock, and although it is possible that Puffins now no longer breed there, no evidence to this effect is given in this life history. The reviewer saw a pair of Puffins at Seal Island in July, 1912, but Dr. C. W. Townsend could find none there in the summer of 1920.

In the life history of the Horned Puffin, mention is made (p. 98) of a breeding colony of the species on Atka Island, Aleutian Islands, and it is stated (p. 103) that the breeding range of the species extends "throughout the Aleutian Islands." On page 100 it is stated that "The southernmost colony of Horned Puffins, so far as I know, is on Forrester Island in southern Alaska." Forrester Island is much farther north than Atka Island, and, in fact, is farther north than a large part of the Aleutian chain.

The most southern point in the breeding range of the Herring Gull is stated (p. 102) to be No-Man's-Land in Penobscot Bay, Maine, although a foot-note adds that a few Herring Gulls have recently bred near Marthas Vineyard. But in any event, No-Man's-Land is not the most southern breeding place of this Gull, for there is a large well-known breeding place on Seal Island, Yarmouth County, Nova Scotia, which is farther south than No-Man's-Land.

Recent publications by Dr. C. W. Townsend do not describe the Common Murre and the Razor-billed Auk as being so nearly extirpated on the southern coast of Labrador as Mr. Bent's remarks on this subject would lead one to conclude.

On page 8 ("Gulls and Terns") it is stated that Mr. Frank C. Hennessey "accompanied the A. P. Low expedition to the regions north of Hudson Bay". This is incorrect. Mr. Hennessey's valuable experience in the Arctic was gained while he was with the expedition on the Dominion Government Steamer *Arctic*, under command of Capt. J. E. Bernier, in 1908 and 1909. He did not accompany the A. P. Low expedition.

In the description, on page 330 of the second volume, of Plate 16, showing Great Black-backed Gulls, it is stated that the lower photograph represents "adult and young bird, one year old". This is evidently an error for "adult and bird of the year", for Great Black-backed Gulls, one year old, are not given to frequenting the nesting-grounds of the species, and the individual in question appears to be in the juvenal plumage.

Although the life history of the Great Black-backed Gull makes frequent mention of the breeding colony at Lake George, Yarmouth County, Nova Scotia, the breeding range of this species is said (p. 85) to extend "southward . . . to . . . Nova Scotia (Pictou, Halifax, and Kentville) and Bay of Fundy (Isle au Haute)". Lake George is considerably farther south than any of the four other points named.

In the description of the former breeding range of the Laughing Gull no mention is made of the fact that it extended to Canada. Dr. H. Bryant collected two pairs on Green Island, near Yarmouth, Nova Scotia, in 1856. The condition of the females showed that they had just finished laying. (*Proc. Bost. Soc. Nat. Hist.*, VI, p. 122.)

The statement is made concerning Thayer's Gull (p. 121) that only some 25 specimens of the species are available for study. The Victoria Memorial Museum, Ottawa, is fortunate in possessing a fine series of some 30 specimens of Thayer's Gull.

Finally, a few remarks may be made concerning the editing of these works. Publications of this kind need make no pretense to artistic merit, which may characterize the writings of none but the gifted few, but sound English is justly to be expected of them. The facts of science should be correctly expressed. It is true that exact quotations from other publications must at times introduce incorrect expressions, and that misprints cannot be wholly avoided. These things are excusable. But the original matter of the volumes under review contains a large number of conspicuous solecisms which cannot be defended. The over-heavy burden of work which the production of these life histories doubtless lays upon their author may confine his attention to the ornithological facts involved, but it is regrettable that there should not be more careful editing of the text of these important official publications.

Everything considered, these "Life Histories" are most interesting, valuable, and important volumes, which should be found in every library and should be in the hands of every ornithological worker. It is to be hoped that future volumes of the series will appear with as little delay as possible. They will be awaited eagerly.—H. F. L.

The Canadian Field-Naturalist

VOL. XXXVI. OTTAWA, ONT., FEBRUARY, 1922. No. 2

SOME NOTES OF THE GROWTH OF ARBUTUS MENZIESII—PURSH

By C. C. Pemberton

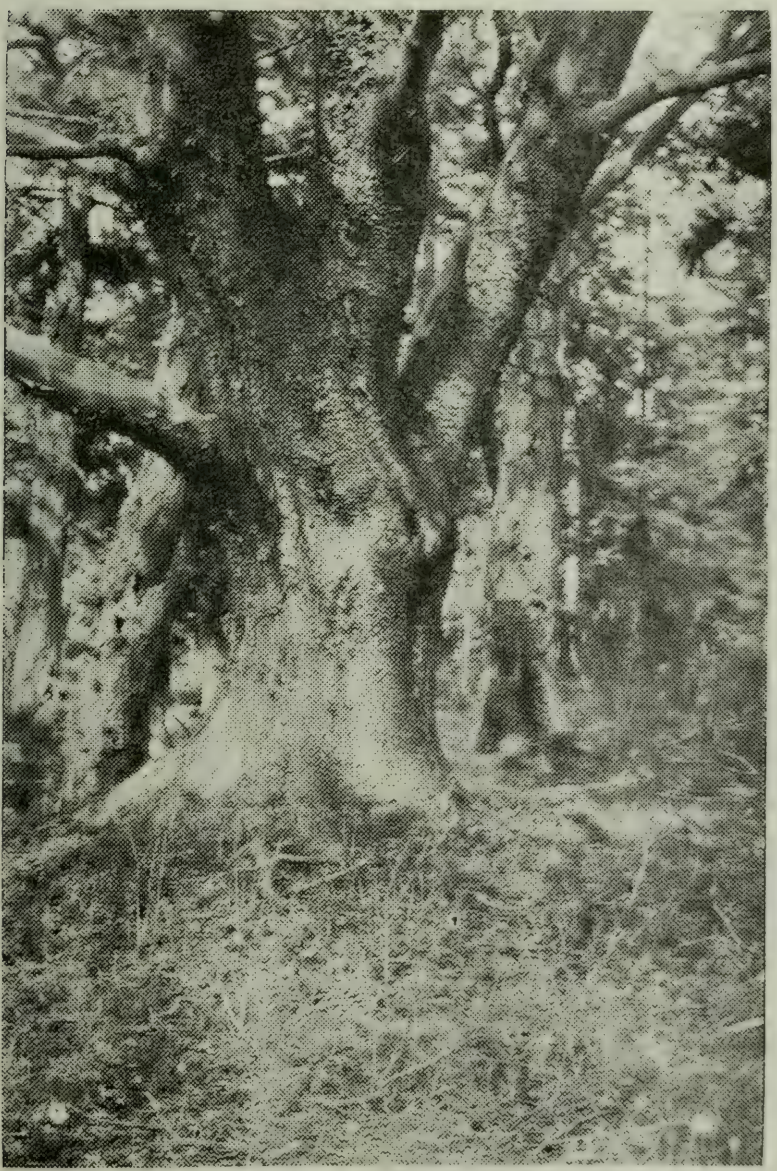


FIG. 1.—PIONEER TYPE. Arbutus Menziessii, Pursh

This arbutus is a good example of the open grown tree of the natural park-lands of the southern end of Vancouver Island. The limbs stretching forth all around the stem denote that the tree in early life had plenty of room. The second growth Douglas Fir is evidently of recent origin. Locality, Rocky Point, Metchosin, Vancouver Island, B.C.

PIONEER TYPES.

The arbutus is a tree the habits and characteristics of which are of absorbing interest to the nature student. Its occurrence and distribution in these latitudes is fittingly described by John Muir ("Steep Trails," Houghton Mifflin Co., Boston and New York, 1918, p. 235) as "standing there like some lost or runaway native of the tropics, naked and painted, beside the dark mossy ocean of northland conifers."

On the southern end of Vancouver Island, in the vicinity of Victoria and on many of the adjacent islands of the Straits of Juan de Fuca and the Gulf of Georgia, the pioneer type of arbutus grew as large single trees, scattered on the plains, on the margins of the forest and on the sparsely wooded crests of hills and rocky elevations. The forms of these arbutus denote that they have grown in the open and were not at any time in early life crowded by other trees. A good example of the type is

shown in Fig. No. 1. The huge limbs stretching out in all directions prove that the tree must have had plenty of room in the past. The young growth of Douglas fir surrounding the arbutus is of recent origin.

HELIOTROPIC RESPONSE.

When the arbutus is compelled to strive for light in competition with other trees it shows the characteristics of positive heliotropism to a degree surpassing most of its competitors. It has learned to dodge and looks as if it were trying to avoid contact wth its neighbors. If the surrounding trees are destroyed, then the arbutus, curved and bent over, forms a unique feature of the landscape. In Fig. No. 2 the curved arbutus is a good example of the heliotropic response due to light contest with other trees, since removed. The characteristic of positive heliotropism seems to obtain to a similar degree in arbutus, wherever it is found. Prof. Jepson, ("The Trees of California," Willis Linn Jepson, Ph.D., Cunningham Curtis and Welch, San Francisco, 1909, p. 208) referring to the phenomenon says:

> Madroña is rarely symmetrical and the older the tree the more unsymmetrical as a rule. This is notably the case in the Mendocino and Humbolt woods, where it is invariably pushed to one side when in light competition with Douglas Fir or Tan Oak. Huge Madroña crowns, wholly one-sided, are frequently met with; sometimes the aggressive companion trees disappear and leave these irregular Madroñas standing alone. Very frequently one finds a long trunk curving out of the perpendicular 20 or 30 feet and up 60 or 70 feet to a wisp of a crown occupying a very small area of the forest canopy. Such trees are remarkable for their curving and often huge trunks, which are commonly very tall and often flattened contrary to the direction ofthe curve.

The curved and bent specimens of *Arbutus unedo* L. on Dinis Island, Killarney, Ireland, figured in Plate No. 157 of "The Trees of Great Britain and Ireland," (John Henry Elwes, F.R.S., and Augustine Henry, M.A., Vol. III, Edinburgh, 1908) are presumably the result of heliotropic bending. The curves may, however, be caused by wind.



FIG. 2.—HELIOTROPISM, Arbutus Menziessii, Pursh

Example of curved stem of arbutus due to former contest for light, with other trees since destroyed. Many of these odd shaped trees are to be found. Locality, Scenic Drive, Mount Douglas ("Cedar Hill") Park, Victoria district, Vancouver Island, B.C. *Illustration kindly loaned by the Victoria and Island Publicity Bureau, Victoria, B.C.*

CONTINUITY IN FLOWERING.

The flowering and fruiting of the arbutus form interesting phases of its life history.

Sometimes the trees of a whole district will totally discontinue production of floral buds for several seasons, or, in the same grove, some of the trees may cease while others continue vigorous production.

During the years that arbutus does carry on activity in flowering the continuity of the operation is remarkable. Without any marked resting period, from early spring to late autumn flowering may be found in every stage; buds, blossoms, and berries. During the winter months—generally from about November to March—no fresh buds develop and the late buds do not blossom, though they continue to increase in size and advance another stage toward the blossom throughout every mild spell, until



FIG. 3.—CONTINUITY IN INFLORESCENCE. Arbutus Menziessii, Pursh.

Buds, blossoms and berries, picked from the same tree, 2nd November, 1920. Locality, Cadboro Bay, Victoria district, Vancouver Island, B.C.

sooner or later in the spring the flowering commences.

Continuity of flowering has taken place for nearly four years, without cessation, in some of the arbutus trees I have observed at Cadboro Bay and other points on the Coast. The illustration given in Fig. 3 shows the ripening berries of the earlier blossoms and the new flower buds of the autumn, picked from the same tree at Cadboro Bay, on 2nd November, 1920.

Many trees, such as willows and alders, develop catkins during the autumn, the willows of the higher and drier areas commencing in November and those of the colder swamps not until April or May. The flowering dogwood (*Cornus nuttallii* Aud.) often also has an amount of continuity in blossom. Two sets of flowers may occur in a season. Floral buds, too, can develop in the late autumn and persist all winter. To my mind, however, there is a difference between this and the arbutus, for in the latter species there is no resting period between successive periods of flowering, whereas in the willows, alders, dogwood, etc., there is.

As will be seen by the letter and table of temperature kindly supplied to me by Mr. F. Napier Denison, Superintendent for British Columbia, Dominion Meteorological Service, Gonzales Hill, Victoria, B.C., and printed below, the weather conditions have been somewhat abnormal during the last four years. Mr. Denison's idea about the tempering effects of winds blowing off tidal waters is borne out by the fact that the floral buds on arbutus trees near the shore withstood the temperatures given by Mr. Denison while those farther inland were cut off by the frosts. The dogwood also suffered inland but near the sea was uninjured.

Victoria, B.C., April 15th, 1921

C. C. Pemberton, Esq.,
Sayward Building,
Victoria, B.C.

Dear Sir:

In reply to your letter of last December and enquiry of recent date respecting climatic conditions at Victoria during the past few years, I take pleasure in enclosing you a table bearing on this subject for 1919, 1920 and to March, 1921, and monthly normals for precipitation, temperature and sunshine.

You will note from the enclosed that in 1919 the summer and winter were abnormally cold and particularly in November and December. In 1920 the rainfall was abnormally light in February while from the early summer to the close of the year it was unusually heavy; and again in January and February, 1921, the rainfall was abnormal.

I am inclined to think that why the Arbutus grows so well about Victoria is on account of the tempering effect of the winds usually blowing off the tidal waters of either the Strait of Juan de Fuca, that is, from the southwest in summer, and across the Strait of Georgia from the north in the winter.

It may interest you to know that the annual amount of bright sunshine here is more than in any part of the British Isles, even including the Channel Islands.

Trusting the enclosed information may be of some service to you,

I remain

Sincerely yours,

F. NAPIER DENNISON,

Superintendent in B. C.

(See top of page 25 for Meteorological Table.)

A REMARKABLE SPECIMEN.

The arbutus pictured in Fig. No. 4 is a curiosity. Its life history as revealed by its growth-form is an enigma. There is the long root—or stem—stretching across a pocket of soil in the top of a cliff of rock and bending at one end over the edge of the cliff and then making a curve up and out into a normal shaped tree. The cause of this very unusual method of growth is difficult to ascertain. The district in which the tree is situated is one of those settled and populated early in the history of Victoria and I enquired from the older inhabitants of the locality for any particulars of the early life of the tree but could gain no information. No one seemed to have noticed it and no data as to fires or other destructive agencies could be obtained. The appearance at "A" seems to indicate that at one time there was a vertical shoot at the point. In fact, it looks as if there had been a good sized tree and that from it a root had descended in the direction "D" toward the lower ground. If this were so, then the piece "A"- "B" - "C" would have been another root mostly on the surface but with a short portion covered with soil at "B" and hanging over the cliff at "C." As can be seen by the illustration, the stem of the tree existing at "C" when the photograph was taken really commences to be a true stem at the point "C". The stem, or root (whichever it is), "A" - "D", "A" - "B" - "C" has the appearance of having suffered great ill-usage. It is decadent throughout its length except where the small portion at "B" is covered with soil. This covered up part proved on examination to be vital and in good condition. These circumstances have led me to believe that an original stem at "A" may have become destroyed and, in consequence, an adventitious shoot had subsequently sprung from the over-

VICTORIA, B.C.

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year	
1919														
Highest Temperature	52.0	50.9	62.5	67.2	68.5	70.0	84.5	80.4	81.4	67.2	55.3	52.5	84.5	July.
Lowest Temperature	33.0	27.0	32.0	36.8	39.8	42.8	47.2	47.7	42.0	31.7	29.7	15.5	15.5	Dec.
Mean Temperature..	41.3	40.1	44.0	48.9	52.1	54.4	58.5	58.8	57.7	48.2	42.8	38.0		
Precipitation.....	5.81	2.75	2.22	2.90	.79	.53	.02	.34	1.35	1.30	5.53	4.79	28.33	
Hours of Sunshine...	59	80	150	195	273	283	378	325	242	136	51	94	2265	
Prevailing Wind.....	N	SE	SW	SW	W	W	SW	SW	SW	N	N	N		
1920														
Highest Temperature	53.0	53.0	58.8	64.7	67.4	78.2	91.3	84.3	74.0	59.0	58.0	50.9	91.3	July.
Lowest Temperature.	24.8	32.2	31.8	30.0	39.8	43.0	48.6	46.3	45.7	37.3	34.8	32.1	24.8	Jan.
Mean Temperature..	39.2	41.6	43.9	45.5	49.9	55.7	59.8	61.1	55.0	48.5	46.0	42.5	..	
Precipitation.....	5.55	.62	2.28	1.45	1.37	1.04	1.00	1.61	3.62	4.03	3.11	4.62	30.30	
Hours of Sunshine...	52	141	134	230	303	255	345	346	173	99	104	31	2213	
Prevailing Wind.....	N	N	SW	SW	SW	SW	SW	SW	SW	N	N	SE		
1921														
Highest Temperature	51.8	55.0	56.2	..	..	..	..	..	..	..	..			
Lowest Temperature.	29.0	27.5	30.0	..	..	..	..	..	..	..				
Mean Temperature..	40.2	41.5	43.9	..	..	..	..	..	..	..				
Precipitation.....	5.55	4.28	1.23	..	..	..	..	..	..	..				
Hours of Sunshine...	58	80	174	..	..	..	..	..	..	..				
Prevailing Wind.....	SE	N	N	..	..	..	..	..	..	..				
AVERAGE														
Mean Temperature..	39°	41°	44°	48°	53°	57°	61°	60°	56°	51°	45°	41°	50°	
Precipitation.....	4.31	3.13	2.33	1.25	.99	.85	.44	.62	1.53	2.73	4.58	4.69	27.45	inches
Hours of Sunshine...	71	80	142	197	258	279	300	304	189	130	77	60	2087	

hanging root at "C". When I first saw the tree it was in fairly healthy condition but it has been failing slowly ever since, and when the photograph was secured there were only one or two branches alive. Not long after this the stem became broken off at a point a little to the right of "C". The break revealed the fact that the lower side of the stem was alive and in a healthy condition and furthermore that it had living rootlets penetrating into the soil of the crevice. Perhaps the misshappen and fasciated appearance of the stem at "C" may be because it had originally



Photo by courtesy of the Victoria and Island Development Association

FIG. No. 4.—A MOST REMARKABLE SPECIMEN, Arbutus Menziessii, Pursh

The cause of this most remarkable growth is unknown. The tree has, since the taking of the picture, died and rotted away.

been a root. Although I have never seen nor heard of arbutus throwing out adventitious shoots from roots, in the way poplars and many other broadleaf trees do, it can, nevertheless, make adventitious growths from stumps and roots under certain conditions. There are many instances of rings of shoots arising from the rims of the stumps of the huge dead pioneer arbutus trees of the isolated type once scattered over the area surrounding Victoria. Adventitious growths can also spring up at the base of the stems of the big ancient arbutus trees of the forest as soon as the competing trees are cleared away. The young growth often takes the place of the parent tree which, owing to its wisp of canopy, usually dies away. Further proof of the ability of arbutus to develop adventitious shoots from roots is to be seen when a large tree is blown over on its side but part of its root system remains in the soil. In cases of this kind, adventitious shoots are known to be thrown out by the upturned roots near the base of the stem. A striking illustration of this was noted at a field meeting of the Natural History Society of British Columbia held at "Tiswild," the residence of Mrs. McVicker, in the Highland district, Vancouver Island. A still more remarkable instance of a similar occurrence was found at "Allbay," the property of W. T. V. Copeman, Esq., near Sidney, on the Saanich peninsula, Vancouver Island. A fair-sized arbutus growing in shallow soil had been blown down but the roots on one side had remained in the soil. The flat base of the stem had become upturned and had exposed its underside to light. The consequence of this was that a strong shoot sprang from the upturned lower side and when I saw the tree both the original stem and the young shoot were thriving.

Another explanation of the cause of the peculiar position and mode of growth of the arbutus in Fig.No. 4 may simply be that a seed had germinated in the crevice at "C". If this be so, the length of the root "C" - "B" - "A" - "D" is remarkable and its course and the loop and fasciation of the stem at "C" are unusual.

The heliotropic power of the arbutus may be another reason for the peculiar appearance of this arbutus. Contest for light between the arbutus and some other trees once growing together on the crest of the cliff may have induced the arbutus to creep along the ground and therefore "A" - "B" - "C" may be a stem which, in bending toward the light, had layered where it has touched the soil. Arbutus, however, so far as I am aware, does not naturally layer. Some scrub oak (*Quercus garryana* Dougl.) can be seen in the illustration near the point "A" and may be sprouts from the remains of some former large oak that once competed with the arbutus for light. Garry oak is plentiful in the neighborhood.

A PROPOSED BIRD SANCTUARY IN BRITISH COLUMBIA.

BY J. A. MUNRO, OKANAGAN LANDING, BRITISH COLUMBIA.

The notable increase in the migrations of ducks and geese, following the ratification of the Migratory Birds Convention, has given an impetus to bird-protection which is apparent wherever sportsmen or nature-lovers are gathered together. In marked contrast to the pessimism rife in the five years preceding 1918 (which, at its worst, prophesied the end of water-fowl shooting in another decade, and at best looked for its survival only as an interest vested in the owners of large estates) is the present enthusiasm and confidence in the future.

This is manifested among sportsmen by the earnest discussion of protective measures that would have been condemned as radical and visionary a few years ago. Measures for vermin control, plans for licensing that persistent enemy, the domestic cat, reduction of bag limits, etc., are questions brought up at every game association meeting.

Another expression of the popular enthusiasm is the growing demand for Bird Sanctuaries. Unfortunately, the supply of Dominion lands suitable for sanctuary purposes in this Province is not equal to the demand—or the need. A number of property owners who control land of this type have requested, with characteristic western generosity, that such areas be created permanent Bird Sanctuaries under The Migratory Birds Convention Act, even though this restriction would mean the loss of their shooting privileges.

Swan Lake, which has been proposed as a Bird Sanctuary, is approximately three miles long and half a mile wide, its southern end being three quarters of a mile from the city limits of Vernon. The land surrounding it is of high fertility, and the greater portion is under cultivation. There is a considerable acreage in orchard, and alfalfa is grown extensively. Between the edge of cultivation and the lake shore is a fringe of brush, chiefly alder, willow, mountain birch, and black haw, and in several places on the east shore there

are poplar and alder stands, several acres in extent. The fore-shore is boggy and alkaline for the most part, with infrequent stretches of narrow sandy beach. Where the lake bottom is sandy, bog rush is the chief aquatic growth, but in the muddy portions there is a heavy growth of tules, several hundred yards wide in some places. The marsh area is widest at the north end of the lake and is intersected by several weed-choked lagoons. The lake is shallow, probably not exceeding eight feet in depth, and is fed by two small streams, one at each end. The only outlet is a small stream at the north end, which joins Long Lake Creek near Vernon.

Trout are said to have been plentiful at one time, but none have been caught within recent years. There is, however, an abundance of *Cyprinoids* and several species of larger coarse fish, which supply the needs of Loons, Ospreys, Kingfishers and other fish-eating birds.

This shallow lake with its encircling marsh is probably more prolific in bird life than any other lake of its size in the Okanagan Valley. The growth of marsh plants, thriving in the warm water and drawing vitality from the decay of past years, is amazingly rapid, and fortunately the carp, which are reducing the marshes in the lakes of the Okanagan chain, have not yet made their appearance.

On a day in June, this expanse of waving green and the air above it fairly hum with insect life. The water, too, is alive with little fish, with crustaceae and with the larvae of the insects that swarm on the plants above. To this endless banquet come the birds in their hundreds. Marsh Wrens peer from the tule clumps and burst into ecstacies of song; Black Terns skim past, barely clearing the tule tops; Coots, Red-heads and Ruddy Ducks swim by in friendly unconcern, while a never-ending procession of Swallows and Red-winged and Yellow-headed Blackbirds fly back and forth. This is accompanied by an almost deafening volume of bird voices, the clamor of Black Terns, chuckling of Coots, rasping of Yellow-heads, the yelping of Holboell's Grebes, the pumping of Bitterns and, cutting through this medley like a knife thrust, the wild, valkyrie call of the Loon.

The fringe of brush along the shore is also alive with birds—Eastern and Western Kingbirds, Western Wood Peewees, Alder Flycatchers, Crows, Bullock's Orioles, Sooty Song Sparrows, Red-eyed Vireos, Yellow-throats, Yellow Warblers and a dozen other species—no stretch of woodland of whatever fertility could support this wealth of bird-life. The North Arm of Okanagan Lake, only a short distance away, is of the same general character—shallow water and marsh-bordered shores—yet it supports a much smaller and less diversified population.

The boggy tule-lined shores and the weedy stretch of water are often viewed with hostility, and at one time a scheme for draining the lake was contemplated. Fortunately this vandalism was abandoned and it is to be hoped that such an exceptionally attractive breeding-ground for water-fowl will be left in their undisturbed possession for all time to come.

The following notes were made during the summers of 1916 and 1918 when I spent several days exploring the marsh and studying the birds breeding in it.

HOLBOELL'S GREBE: *Colymbus holboelli*. On May 15th, 1916, flocks of Holboell's Grebe were seen in the open water chasing one another with a great deal of splashing, and calling in chorus. Their courtship is a rough and tumble affair, consisting chiefly on the part of the males in a display of pugnacity towards others of their sex, and, on the part of the females, of a waiting attitude. There is none of the graceful posturing and display-flights that make the courtship of the more highly organized diving-ducks such a delightful spectacle.

A partial exploration of the marsh three weeks later brought to light twenty nests, some only recently completed and empty, others containing from one to four eggs. The nests varied slightly in size, but otherwise were identical—sodden masses of bog rush, black with a season's decay, floating with the larger portion below the surface. Generally, they were moored in a clump of rushes and, in most cases, close to the outer edge of the marsh where the water was from two to four feet deep. My noisy approach through the rustling tules was sufficient to alarm the sitting bird and she or he (as both sexes help in the work of incubation) would slip off the nest and glide through the tules to the open water without being seen. Usually the mate was not far off and, together, they would swim back and forth in front of the nest, some thirty or forty yards from the marsh. Frequently, the sitting bird had had sufficient warning to cover the eggs with some of the loose material on the nest, and in only a few cases were they found exposed.

Usually, they were embedded in the rotting material composing the nest and, no doubt, the heat from this source assisted materially in their incubation.

One bird, apparently a female, was seen with a single youngster riding on her back. Perhaps the rest of the brood had been killed by muskrats as several partly eaten bodies of downy young

were found in the marsh.

These Grebes did not breed in colonies, but each area of marsh contained its quota of nests, and, generally, they were thirty or forty yards apart. As only a small portion of the lake was visited, a correct census of the birds could not be taken, but it was estimated that seventy-five pairs were breeding.

Two years later, June 22nd, 1918, the number had been greatly reduced. During the autumn of the previous year there had been a considerable mortality through a parasitic disease which may explain their relative scarcity in 1918.

PIED-BILLED GREBE: *Podilymbus podiceps.* These were less common and much less in evidence than the last. Sitting birds would steal away from their nests without being seen and did not show the solicitude for their eggs that marked the behaviour of the larger species. A nest containing seven eggs and another with one egg were found on May 15th, 1916. The nests were smaller than the Holboell's, but built of the same material in similar situations. In both nests the eggs were completely covered. Another nest, containing eight eggs, was found on June 8th, 1916, and the covering of wet weeds was removed, leaving the eggs exposed. Upon my return to the nest twenty minutes later, it was discovered that the bird had returned in the interval and had covered the eggs again.

Two nests, similar to the last, found on June 22nd, 1918, contained three and five eggs respectively and the birds were seen gliding through the rushes with only head and neck above the water. These were the only occasions on which I was able to obtain a glimpse of the birds as they left their nests.

LOON: *Gavia immer.* A pair seen on June 8th, 1916, were swimming back and forth in front of a marshy point in one of the lagoons at the north end of the lake. Their nest was quite close but impossible to reach without the aid of a boat. Two other pairs were seen at a distance in the open water. On June 22nd, 1918, two downy young were in the same lagoon. They dived through the matted weeds on the surface, appeared for a moment farther on, and then vanished in the thick tules while the parents called to them from the open water fifty yards distant.

BLACK TERN: *Hydrochelidon surinamensis.* Finding a breeding colony of Black Terns was a decided surprise. I had no record of their breeding in the Okanagan Valley and had known them only as scarce migrants. When I was approaching the marsh on May 18th a band of thirty or more were seen flying over the lagoon, and, as I neared the water's edge, they flew towards me, circling over my head with cries of alarm. A thorough search of the marsh was made for nests, but nest-building had not started. Three weeks later, on June 8th, the birds had started laying and a number of nests contained one or two eggs. Most of these were on a floating mass of dead rushes which had drifted into the lagoon and lodged against the tules. In a few nests a scant lining raised the eggs above this floating mass of debris, but the greater number consisted of a simple arrangement of dead rushes, barely sufficient to keep their contents from rolling out. In the play of light and shadow diffused through the tall encircling tules, nests, eggs and the immediate surroundings blended so harmoniously that many nests would have escaped observation had it not been for the excited cries of the parents as they wheeled low over the nesting sites. Several nests, and these were conspicuous, departed from the usual in being made of fine reddish roots of some water-plant, probably brought to the surface by a muskrat. One bird was seen brooding eggs on a small piece of floating debris in one of the deeper portions of the lagoon and she remained there quietly while I watched at close range—close enough to see the maroon-colored gape and the gentle brown eye.

While I was wading through the tules, the Terns flew around me on all sides, often within arm's length, and were quite devoid of fear in their parental solicitude. Often three or four birds, following each other closely, would fly straight towards me until within a few feet, when they would rise slightly and pass over my head, to circle back and repeat the manoeuvre. While the birds were frequently all in the air at the same time, they turned and wheeled or dropped out of sight behind the tules so quickly it was impossible to count them. Ten nests were found, but it is thought the colony numbered twenty pairs at least. The breeding ground was restricted to an area about two hundred yards square at the north end of the lake.

When I visited the marsh next, on June 22nd, 1918, the Terns were in the same place and the colony was larger. The floating masses of rushes were again in position and afforded the chief nesting site. With the increase in the number of birds, the nests had been built closer together and in several places four or five were in sight at one time. Twelve nests were examined, the majority of which held three eggs, the maximum number.

CINNAMON TEAL: *Querquedula cyanoptera.* Three drakes and two ducks were seen swimming close to shore on May 18th, 1916, and on June 8th, 1916, two drakes and one duck were seen together. It is probable that they were breeding

but I was unable to find a nest. This species is uncommon in British Columbia and these were the first I had seen in the flesh.

REDHEAD: *Marila americana.* Redheads were in small flocks performing their courtship antics on May 15th, 1915. On June 8th, the majority were paired, but one band of seven drakes and five ducks were still in the courtship stage. The mating period is probably of longer duration with this species than with any other duck. I have seen them courting and actually copulating as early as February 28th, and it is doubtful if eggs are ever laid earlier than the first week in June.

Only one nest was found on June 8th and this contained four fresh eggs. The nest, a deep hollow on the side of an old muskrat house, was well lined with dry tules, and screened from view on all sides by a rank growth of tules. While I was examining the contents the parent birds, flying close together, passed overhead within a few feet.

On June 22nd, 1918, three nests were found and all the birds seen were in pairs. The first nest, containing two eggs, was a slightly concave platform of mixed dry and green rushes, measuring twelve inches in diameter and placed at the base of an isolated clump of bog rush. The top surface of the nest was eight inches above the water and perfectly dry. The second nest was in the thick patch of tules and from the nest to the open water twenty yards distant led a well trampled trail. This nest was a flat platform of dry rushes, sixteen inches in diameter, resting on a springy mass of dead vegetation which raised it well above the surface of the water. It had been deserted for some reason; possibly the female had been killed on the nest by a muskrat. The nine eggs were scattered over the nest, two had rolled out and two others were broken. It was found, on preparing them, that four contained dead embryos; two were fresh (that is, they had not been incubated) and one was infertile. Possibly the two fresh eggs had been laid by a second female. A third nest, containing eight eggs, was discovered twenty yards farther on in the thick tules. This was evidently a second laying as the nest was a very flimsy affair. The slight platform of rushes was not thick enough to prevent the marsh water from seeping in and several of the eggs were lying in the water. No down had been added to any of the three nests. One brood of six downy young was seen on the same date. The female led them from the protecting tules and half swam, half flew along the surface of the lagoon and out to the open water.

RUDDY DUCK: *Erismatura jamaicensis.* On June 8th a band of ten Ruddy Ducks was seen in a small pond in the tules. The six drakes, with burnished copper backs and broad pale blue bills were conspicuous objects on the black water. Resting placidly on the surface of the pond they appeared as if submerged lower than other diving ducks; heads were carried well back between the shoulders with no neck showing and tails were stiffly erected at right angles to the body. I watched for half an hour in the hope of seeing an exhibition of their courtship display, but the drakes remained utterly indifferent, occasionally dabbling their bills in the water or preening their feathers.

Two fresh eggs, undoubtedly belonging to this species, were discovered buried in the decomposed vegetation on the side of a muskrat house. There was no sign of a nest, the parents were not seen and I am at a loss to explain their peculiar situation.

AMERICAN COOT: *Fulica americana.* Next to the Red-winged Blackbird, this was the commonest bird at the lake in 1916 and it was estimated that two hundred pairs were present. The nests were made of dry, flat tules, securely based in a clump of tules or bog rush and high enough above the water to insure dryness on the upper surface. They varied considerably in size, but the average nest measured twelve inches in diameter and was sufficiently concave to prevent the eggs from rolling out. The number of eggs in a clutch varied from six to eleven. Several of the eggs were pipped in one nest and the scarlet bills of the chicks could be seen through the openings. On June 8th, two broods were seen, little flame-colored balls swimming in close formation after their mothers.

The sitting females showed little fear if disturbed from their nests, swimming to the open water in their leisurely fashion with head swinging back and forth to an accompaniment of unmusical clucks and gurgles and, as soon as the coast was clear, they would swim back to their nests. Evidently, they live in the closest harmony with the Holboell's Grebe, as it was usual to find the two species nesting within ten or fifteen feet of each other.

YELLOW-HEADED BLACKBIRD: *Xanthocephalus xanthocephalus.* Until the first trip to Swan Lake, my acquaintance with this handsome Blackbird was only a casual one; I had seen wandering couples in the summer and occasional migrants in the spring. On July 28th, 1914, a flock of perhaps forty, nearly all adult males, alighted in a bunch of rushes on the shore of Okanagan Lake and clung for one exciting moment to the slender stalks which bent beneath their

weight. They rose in a body, crossed the lake in a compact flock, and did not appear again.

Apparently they leave their breeding ground at Swan Lake after the young are fully fledged and seek new feeding grounds. While I was driving past the lake on July 23rd, 1915, a large flock of moulting adults and juvenals accompanied by an equal number of Redwings was seen in a row of trees along the roadside. From there they flew to an open grassy hillside, evidently hunting for grasshoppers. It was with keen expectation, therefore, that I looked forward to the following summer when I could hope to find them at home on their breeding ground.

In the chorus of bird voices that greeted my ears on reaching the marsh, the harsh, unmusical mating song of the Yellow-head was the most insistent. The males clung to the swaying tules within a few yards of the shore and when disturbed would fly to the top of the nearby willows, while the females kept hidden in the tules for the most part. Preceding the rasping song, there is a plumage display that shows off the contrasting black and yellow to the best advantage. In this rather grotesque performance the shoulders are elevated, the head lowered and the feathers puffed out, greatly exaggerating the performer's size. Then the unpleasant bray comes as if ground out by main strength, and, at the conclusion, the bird collapses into his sleek handsome self again.

On this date, May 16th, nest-building had started, but no nests containing eggs were discovered. On June 5th, a dozen nests containing from two to four eggs and several others with nestlings were found. The Yellow-heads nested in small groups of three or four pairs each, often close to a pair of Redwings, with whom they seemed to dwell on neighbourly terms. The Yellow-heads' nests were slightly larger than those of the Redwings and were invariably lined with flat pieces of tule fibre, which always served to distinguish them, as the Redwings used coarse grass for lining. They were firmly woven in a clump of stiff brown tules of the previous year's growth and generally fastened to the stoutest part of the stalks, one to two feet above the surface of the water. The eggs showed a wide variation in size, shape and markings.

No attempt was made at taking a census, but it would be safe to place the breeding population at thirty pairs. Two years later, on June 22nd, this was at least doubled. Nests with fresh eggs and others with nestlings of various ages were found.

NORTHWESTERN REDWING: *Agelaius phoeniceus caurinus*. These are the commonest birds at the lake and they raise two if not three broods during the season. On May 15th were found nests containing fresh eggs and others containing young, from the naked stage to those almost ready to fly. On June 8th conditions were much the same and fresh eggs were noted as late as June 22nd. The nests are in no way different from those of the type form and the eggs show the same wide range of size and markings.

INTERIOR TULE WREN: *Telmatodytes palustris plesius*. The globular loosely woven nests of this species were a feature of every patch of tules, and the tireless little architect was always to be seen or heard. The occupied nests were softly lined with bullrush-down, and the eggs were piled one on top of another. The unlined cock-nests outnumbered the occupied ones in the proportion of six to one. Often three or four were seen within a few yards, probably all built by the same bird as an outlet for his superabundant energy.

THE MOUNTAIN BEAVER (*Aplodontia rufa*) *

BY KENNETH RACEY

The following notes have been made during the past three years and have now been combined in this paper in the hope they may prove interesting and assist in fuller knowledge regarding a curious and little known animal, the mountain beaver, sewellel, boomer or ground hog, as it is variously known.

Large and increasing colonies of these creatures are to be found within a comparatively short distance of Vancouver, where they live in peace and quietness, seldom disturbed or indeed seen by man, owing to their being nocturnal in habit, coming out at dusk to feed and retiring again to their burrows at daybreak.

Resembling the muskrat at first sight, but without the long bare tail, they are not easily mistaken for any other animal. The fur resembles more closely that of the true beaver (*Castor fiber*) than that of the muskrat, (*Ondatra zibethica*). As a matter of fact, the mountain beaver, although not closely related to any existing rodent, is allied to the squirrel tribe. The ears are smal

*Read before The Vancouver Natural History Society, 1921

and round and the tail very short, being only three-quarters of an inch in length and covered with fur. The name "boomer" was given to these animals from the peculiar booming noise made at night.

They are found only on the eastern and western slopes of the mountains of the Pacific Coast in Canada and the United States of America. So far, the most northerly record for these animals is the Fraser Valley, thence they extend southerly to northern California.

These animals have been known to climb trees a few feet in search of food, but, judged from the structure and short hind legs, they cannot be very expert climbers.

They travel considerable distances from burrows and have frequently been caught in traps set in sloughs for muskrats. They have been found living at an altitude of 3,000 feet, near Coalmont, B.C.

After removal of the skin, the body resembles that of the mole more than that of the muskrat, woodchuck or squirrel. The joints are loose and flexible, and all parts of the head, neck, body and legs are encased in tough, powerful muscles. The neck is extremely short and so heavily covered with muscles that in diameter it is the same size as, or larger than, the head. The shoulder blades are situated only one-half or three-quarters of an inch distant from the base of the skull, so short is the neck. The skull is flat and broad, and the lower jaw attached by powerful muscles. The bones of the hind legs are short for the size of the animal and from the muscular development it would appear they are much less used than the strong fore-legs which are used in digging the wonderful tunnels these animals are known to make. The tail is very short, being not more than three-quarters of an inch to one inch in length, and is curved upwards like that of the rabbit or hare. The eye is dark in colour and small in size, the eyeball measuring only 7-32 to $\frac{1}{4}$ of an inch in diameter, indicating a dark-loving animal. The claws are long and strongly made for digging in the earth. The skin is loosely attached to the body as with the marmot. Two small scent bags are situated at the base of the tail and from these a peculiar musky scent is produced when the animal is disturbed or excited. The weight of an adult mountain beaver runs from two to three pounds, but this weight will, of course, vary with the season, as these creatures are fatter in the fall than in the early spring. The teeth, which are strong and chisel-like, are used in the same manner as are those of the ordinary beaver in cutting brush, sticks, roots and salmonberry canes for food, and for gnawing through roots, etc.

When walking about in the vicinity frequented by the mountain beaver one may be surprised, when least expecting it, by the sudden sinking of the foot into the ground for a distance of six or eight inches; on examination, it will be found that this is caused through having trodden on top of a mountain beaver burrow when it has approached close to the surface of the ground. If the burrow is followed for any distance, it will be found to twist and turn in an extraordinary manner, usually keeping from four to twelve inches under the surface, but, in some instances, running to a depth of from three to six feet. The burrows are about six and a half to seven inches in diameter and run for great distances, with openings every few feet. After careful study, examination and excavation of numerous burrows, I have been led to the conclusion that they are so constructed for a dual purpose; firstly, to secure ready access to food supplies and feeding grounds and, secondly, to enable them to escape more easily from their enemies, the marten, mink, skunk, owls and other creatures which apparently feed upon these animals when opportunity offers. In nearly every instance when the burrows have been examined and traced, it was found that they started from a ravine in which a creek flowed, a slough or other damp place where there was a constant supply of fresh running water, and the lower tunnels are so constructed as to be the outlets for little trickling streams of water; in some cases, carefully made canals have been placed to guide the course of the water from the mouths of the burrows. Apparently water and plenty of it is essential to the well-being of the mountain beaver, as it is found only in regions where water is abundant and easily obtained. Mountain beavers are only semi-hibernating, and, while they do not come out much in the winter time, yet they have an abundant underground fresh-water supply, no matter how cold the weather or how deep the snow may be. Far down in their subterranean chambers they live during the cold months amply supplied with water and food. From December until March, they are sluggish and do not come out of their burrows very much; in some instances they have been known to block up (late in the fall) some of the entrances to the burrows.

In one set of burrows examined, a portion in an area of 50 x 50 feet contained sixty-eight entrances to burrows, and, farther down the mountain in a ravine, these burrows had no less than six outlets out of which streams of water poured. One of these I found only through hearing the water gurgling underground, and, on

digging down to a depth of a foot or fifteen inches, found a stream of water an inch and a half deep running through the burrow.

The nesting and storage chamber from which several burrows radiate is usually an enlargement of the burrow to about 12 x 15 or more inches. Here the food is stored for winter use and it is here the young, numbering from two to four, are brought forth in the month of April. The young are born blind.

These animals do not retire high up the mountains at the approach of cold weather as is generally believed, but, as before mentioned, they frequently den up for a portion of the winter.

These creatures are gregarious, several pairs living in the same network of burrows. At the same time, all the specimens I have secured so far show traces of severe fighting, the skins being badly scarred. It is possible some of the many scars were caused by birds of prey or other enemies.

The mountain beavers are very cleanly in habits and keep the burrows clean of refuse, dirt and old unused, decayed food supplies. One burrow was followed for several hundred feet and eventually, at a depth of between four and five feet, the storage and nesting chamber was discovered. This chamber measured about 9" high x 14" wide x 40" long. The northerly part for the first fifteen inches was raised high and was dry, and here the nest of sticks and moss was placed. The rest of the chamber was lower and half full of water. This subterranean reservoir was well made, the bottom being covered with hard sand and small gravel so compact that the water could not escape; the whole upper part of the chamber was smoothly coated with earth or mud as if the animal paid particular attention to keeping everything neat and smooth. Three burrows led in different directions from this chamber.

The food of mountain beavers consists very largely of the canes of salmonberry and wild raspberry which they cut into pieces three or four inches in length and store in their food chambers for winter use. They also eat the green moss which is found growing over fallen trees and logs, as well as the bark of maple trees, and they seem to be especially fond of the "Scotch Cap" leaves and canes. They eat the seeds of the maple, remains of which I have found in their burrows. In one instance, a piece of fungus was found stored with the other food. They are fond of potatoes, carrots, parsnips, cabbages, cauliflowers and other vegetables of all kinds, and are most destructive once they become acquainted with a garden patch. At Yarrow I once found that the mountain beavers had completely eaten up a row of rhubarb. This is worthy of note, as few animals care for rhubarb. One mountain beaver, which I had in captivity for a short time, would eat nothing but green moss and apples, altho I tried it with several kinds of vegetables. They store up fern-roots, leaves, grass, moss, red willow and currant-bush and feed also on the roots of these two latter. As they are nocturnal, they feed and gather their food supplies at night.

Only recently I heard of a rancher finding a quantity of his cabbage and cauliflower neatly cut and stored away by these animals.

In summer time I have frequently noticed little piles of the mountain beaver "hay" lying at the mouths of the burrows, drying and curing before being taken into the storage chambers. These little piles of food are very neatly placed with the butts all pointing one way.

THE "JAPANESE STARLING" IN VANCOUVER, BRITISH COLUMBIA.

BY J. A. MUNRO, OKANAGAN LANDING, BRITISH COLUMBIA.

Visitors to Vancouver with an interest in ornithology, are attracted by an odd-looking, glossy black bird with conspicuous white wing-bars and a curious crest curved forward over the base of the yellow bill. This is a species of Mina, *Acridotheres cristatellus*, known locally as the Japanese or Chinese Starling.

Nothing definite is known regarding the introduction of this species to Vancouver. One story has it that a large wicker cage containing a number of these birds, consigned to a Japanese resident, was broken open in transit from one of the Oriental liners and the birds escaped. Other stories are to the effect that its introduction was deliberate. For some unknown reason, this Mina is prized as a cage-bird by the Japanese, probably for pleasing qualities that are not perceptible to the occidental mind. But, whether their introduction was the result of accident or of design, is of little interest; the important point is, that they are now well established and an acquisition of doubtful value to our avian fauna. The increase of this species has not been as spectacular as was that of the House Swallow, but within the last few years it has been steady and they are gradually spreading from Vancouver into the rural districts. In

common with the House Sparrow, they frequent the city streets in order to feed on the undigested grain in horse-droppings. The curtailment of this food supply that followed the change from horse-traffic to motor-traffic no doubt served to check their increase as it has also reduced the Sparrow population.

They are gregarious to a marked degree and, like the European Starling, show a preference for certain roosts. Small bands forage in the city streets and suburban districts during the day and towards evening gather in large flocks to spend the night under the eaves of certain public buildings in the heart of the city. Their arrival at these roosts is attended by much brawling, jostling and discordant chattering. Neither their manners nor their voices are commendable, although the latter are modified to some extent by a mellow whistling note of a rather pleasing quality. Of these roosts the most important is situated at the corner of Cordova and Carroll Streets, where several buildings provide shelter for a large proportion of the urban population. Other roosts, scattered through the suburbs and the adjacent rural districts, contain a relatively small number of birds. Marpole, conveniently near the fertile farms of Sea Island, is well stocked and New Westminster at present is the farthest outpost of colonization.

From an aesthetic standpoint, the Japanese Starlings have little to recommend them. Their economic status has still to be determined and, as they are aliens adjusting their habits to an unfamiliar environment, any remarks in this connection can only be tentative and subject to future revision. They have their advocates as well as their accusers and for the present they must be kept under surveillance.

The accusations brought against this species are in reference to habits that are also ascribed to the European Starling. Like the last-named and that other quite undesirable alien, the House Sparrow, they are said to oust some species of our native birds from their long established nesting sites, forcibly evicting the rightful tenants. One observer complained that a Japanese Starling had removed fledgling Blue-birds from their nest with his bill and dropped them to the ground. At Marpole, I noticed several Starling nests in old Flickers' holes that ordinarily would have been occupied by Tree Swallows or Blue-birds. It is also stated that they are destructive of small fruits in the rural districts.

On the other side of the ledger, their defenders claim that tent caterpillars are eaten to a great extent and if this is so, it would be a palliation of their objectionable qualities. In this connection, however, it is well to remember what claims were made for the House Sparrow in the early days of its history in America as a check on injurious caterpillars. In the analysis of 10 Starling stomachs taken during the month of June, when the tent caterpillar plague was at its height, there was no evidence that any of these had been eaten. This, of course, is not proof that they are not eaten, and a much larger amount of stomach material would have to be examined before a conclusion could be reached. In all the stomachs examined, vegetable matter was present in excess of animal matter. The former included unidentified fruit pulp, raspberry and service berry seeds, oat husks and leaf fragments, while the latter consisted of the remains of spiders and insects of several orders. Among these were house flies, a larva of a large coleoptera and adults of smaller species, an orthopterous insect in the nymph stage and one millepede.

The importation of foreign species of birds serves no useful purpose and may result in disastrous consequences to our native birds. There have been several attempts to introduce European song birds into British Columbia, chiefly for sentimental reasons, but in part fostered by the erroneous belief that native bird-life is scarce. Bird-lovers in British Columbia may take comfort from the fact that over one hundred and thirty insectivorous and weed-destroying birds are found within the boundaries of the Province. Fortunately, The Migratory Birds Convention Act prohibits the introduction of any species of Migratory Birds without written authority and such activities will be under control in the future.

THE DUCK HAWK

By E. Beaupre, Kingston, Ont.

During the years that I have been interested in birds, I have had under observation two pairs of Duck Hawks, *Falco peregrinus anatum*. One pair occupied the ledge of a granite cliff overlooking a small lake in one of the most picturesque parts of the lake section of Leeds County, Ontario. From the most careful and persistent investigation I was able to trace the habitation of this particular pair for a full half century. Through visiting this lake section at different times, I was able, with the assistance of a settler, to secure many interesting facts concerning the home life of these

birds.

They arrive at the cliff, mated, about the middle of April, and a full clutch of eggs has been laid as early as April 23 (1903). This was an unusually early date, as May 1 is about the average date to find the eggs of this species.

While these hawks inhabit a cliff for many years in succession, they have the habit of changing the location of their nesting site each year. A most inaccessible part of the cliff is selected for the rearing of their young, making it difficult for the curious to intrude or trespass on their sacred territory. Their habits and conduct are regular, firmly fixed and subject to little variation.

The male falcon selects a rampike, usually a short distance back of the cliff where his home is fixed, and this is used as a look-out station or observation post; when not away on a foraging expedition, he here maintains a constant vigil.

The female attends to all the domestic duties of the falcon home, but is spared the task of seeking for food. This is the duty of the male who never fails to secure an abundant supply. During the period of incubation he is particularly attentive in the matter of feeding his mate. The food secured consists in the main of birds, which they capture alive in true falcon style..

Anxious to secure a set of photographs of the young hawks in the development stages of their lives, I visited this particular cliff in the month of June one year. Instead of finding, as I anticipated, a brood of healthy and vigorous fledglings ready to be brought into the field and scope of the camera, I was greeted by the sight and unpleasant odor of four addled eggs. While disappointed in the main object of my long trip and expectations on this occasion, I was privileged to witness a phase in the life of this particular species which I had not previously seen or known from observation and which compensated me for my journey and efforts.

In the vicinity of the addled eggs, the cliff was covered with the remains of the feasts of the falcon family. Distributed over the entire surface I saw regurgitated pellets very similar in size and shape to some that I found near the nest of a Short-eared Owl in Cataraqui marsh a few years ago. On close examination, I found that the pellets contained hair and feathers and the small skulls and teeth of the small short-tailed field voles (*Microtus pennsylvanicus*). At the foot of the cliff were the bodies of two young ground hogs (*Arctomys monex*) which had been killed by the falcons, but had not been used for food. In all my experiences with these hawks, this was the only occasion on which I found any evidence to prove that mammals constituted any part of their food. I am now satisfied that mammals form a very important part of the food of the falcon.

The mechanical or constructive faculty is evidently absent in the falcon as no attempt whatever is made to build a nest, the eggs being deposited in the loose clay which forms the capping of the cliff where they select their habitation. Not infrequently the clutch contains one or more addled eggs. On two occasions I found the entire clutch addled.

When the young falcons are hatched, they are well covered with a soft white down and are able to toddle about shortly after they leave the shell. The lives of the parent hawks are evidently in constant jeopardy. This is no doubt due to the fact that they fall victims to the gun of some farmer who has suffered from their destructive propensities.

A few days after the arrival of the falcons at the cliff in 1914 (April) one of the parent birds disappeared, but the unmated one remained in the vicinity of the ledge until September. In the spring of the following year the single bird returned alone to the old home, where it remained a few weeks, then disappeared never to return to the place where the loss of its partner was sustained.

When the eggs of the falcons are taken they do not lay again the same year, but do not leave the locality until the proper time for their migration, returning at the usual time the following year. In 1918 a most delightful and profitable opportunity came to me in a part of Frontenac County which made it possible for me to continue my observations of the falcon. The conditions were more favorable than on my previous expeditions. In 1920 I secured a set of photographs of the young falcons, and was able to identify the feather remains of the birds which had fallen victims to the rapacity of their parents.

On one occasion, I found falcon eggs in a most unusual location. They were laid among ferns close to some silver birch saplings on the open ground on the top of a cliff. This clutch of eggs is now in the collection of the Rev. C. J. Young, M.A., Brighton, Ontario.

Apparently the development of the young falcon is phenomenally rapid. Different writers on ornithology whose works I have read are united in stating that the period of incubation is one month. I am satisfied the period must be somewhat shorter, probably about twenty-one days. Later on, I hope to be able to settle this question with a greater degree of accuracy. On June 14 I found the young hawks with a heavy growth of white down covering their bodies and completely enveloping the feathers. On visiting

the same brood a week later (June 21) I found that the soft down had disappeared and the plumage was uniformly a rusty brown with black markings. On my approaching the young birds, they objected to my intrusion in loud voices and gave every evidence that my visit was an unwelcome one. But I was there for a purpose, and not even the menacing claws of the parent bird were going to rob me of my intent with the camera.

I found on this visit the shelf of the rock carpeted with the feathers of the bird victims of the falcons which had been used to feed their voracious off-spring. The face wall of the granite cliff was a scene of carnage stained with bird blood, indicating that a sort of "Belshazzar's feast" had been conducted on the spot. Rich booty had been brought from field and farm and slaughtered for consumption. The odor from the decomposing parts that remained uneaten was far from pleasant on a hot summer afternoon. Flies swarmed about the decaying and decomposed victims of the falcon feast, and, having accomplished the chief purpose of my visit, I departed.

Through the asssistance of Dr. Fisher and Mr P. A. Taverner I was able positively to identify the following victims of the falcon slaughter:— Black Duck, Green Heron, Florida Gallinule, Killdeer, Ruffed Grouse, Nighthawk, Blue Jay, Black-billed Cuckoo, Meadowlark, Scarlet Tanager, Brown Thrasher, Flicker, domestic fowl, such as half grown Plymouth Rock, and one undetermined. It will be seen from this list of victims that the Tanager is the smallest bird to attract the attention and tempt the appetite of these hawks.

On the date of my last visit, June 21, the young hawks, judged by their unusual vigor and activity, fully intended to take flight on my approach, which two of them did, the third member of the family being prevented from following the example of the rest by having a canvas smock thrown quickly over its head.

At times these Falcons appear to live on friendly terms with their bird neighbors, and, ludicrous as it may seem, on one occasion an old disreputable Crow disputed possession of the top branches of a look-out tree with the hawk. On different occasions I have observed and recorded Spotted Sandpipers, Kingfishers, Grackles and Tree Swallows living and rearing their families within the shadow of the cliff home of the falcon.

On the wing the falcon is swift and graceful and one is amazed at the speed with which the female catapults from her shelf with a downward thrust to meet intruders, uttering her cackling notes which echo warning along the line of cliff in the early hours of the morning. During the long years of life which one may devote to the interesting study of bird life, many delightful incidents may occur, but climbing a cliff full of difficulties and dangers in order to discover and examine a rare bird's home and its contents has compensations sufficient for the most enthusiastic ornithologist, and I shall always cherish deep in the recesses of memory my experiences in securing these data concerning the Peregrine Falcon.

My latest visit to the home and haunt of the Duck Hawk was on June 9 of this year (1921); except to confirm my previous observations I did not see or become familiar with anything new. Two young hawks were hatched from three eggs, the addled egg still being in the nest. The rock ledge was profusely strewn with the feathers of the victims of the parent hawks, consisting of Black Ducks and Scarlet Tanagers, with a Belted Kingfisher added to the list. The young hawks looked snug and comfortable in their thick covering of white down. The development was so rapid that I received information by June 29 they were strong enough to take flight.

In a crevice of the granite rock about ten feet above the home of the hawks, a pair of Phoebes had built their nest, and, in the midst of all the carnage created by the hawks, the mother Phoebe was tenderly caring for her little brood.

PRESERVING ORDER IN A BIRD SANCTUARY

BY J. A. MUNRO, OKANAGAN LANDING, BRITISH COLUMBIA

The bird sanctuary of the following article is of modest proportions and has no official status under the Migratory Birds Convention Act. It is a garden sanctuary comprising several hundred square yards of orchard about my house and a small patch of brush on the shore of Okanagan Lake. In this small area there is a normal population of about fifteen pairs of birds of the following species: Eastern and Western Kingbird, Western Wood Peewee, Chipping Sparrow, Cedar Waxwing, Yellow Warbler, Tree Sparrow, House Wren, Mountain Bluebird and Robin, and the maintenance of order amongst this varied population occasionally demands that rather drastic measures be taken.

The Robin is usually a welcome boarder. No

objection is made to his inroads on my cherries as he more than pays for this destruction by the number of cutworms he consumes in the spring, and one philosophically reflects that acid food is no doubt essential to his internal economy after a steady diet of insects; and perhaps this desire for fruit is analagous to the craving of the woodsmen for green food after a winter diet of salt pork. But once, for the good of the colony, I had to destroy a pair of Robins and their brood. Before relating this episode it will be necessary to sketch the contemporary history of a pair of Western Wood Peewees.

In the summer of 1917, a pair of these birds built their dainty nest on a nearly leafless branch of a small plum tree beside my front door-step and in due course three cream, umber-spotted eggs were laid. It was the first time Peewees had built so close to my house and I was greatly interested. The nest was six feet above the ground and could plainly be seen by one sitting on the verandah. During the first week while the eggs were being laid, the Peewees would fly out when one walked along the path beside the nesting tree, clicking their mandibles together in protests at the intrusion, "gritting their teeth," as one observer humorously put it. It was not long, however, before they became reconciled to their human neighbors and then, at close range, one could watch the female, sitting tight on her eggs, indifferent to the close inspection, while the male, in a nearby tree, drooped his tail, flycatcher fashion, and showed as little concern. Then one morning the eggs were gone—who was the culprit? Squirrels and chipmunks had been killed off years before. Magpies and Crows gave my garden a wide berth; could it be traced to the nocturnal activities of white-footed mice? There seemed no satisfactory answer.

The following year the Peewees returned to the orchard, again built their nest on an exposed branch of the plum tree and as before, laid three eggs therein. Now, under the eaves of the house a few yards from the plum tree there is a small bird-house usually tenanted by Tree Swallows, and on its flat top a pair of Robins had built a nest and raised their young during the summer of 1917. These birds also returned the following year and used their old nest on top of the bird-house. Shortly after three eggs of the second setting had hatched and the Peewees' eggs were about seven days advanced in incubation, I was sitting on the verandah steps in the evening dusk relating this Peewee story to a friend when one of the Robins was seen to fly into the plum tree. Immediately there was a commotion of rustling wings and snapping mandibles. The Peewees had savagely attacked the Robin and he fluttered to the ground with the Peewees in close pursuit. In a few moments he returned to the tree and hopped along the branch on which the Peewees' nest was built until he stood directly over it, while the Peewees protested from a distance but did not attack again. We waited in breathless excitement for the Robin's next move, and to our astonishment, he deliberately pierced one of the eggs with his bill and carried it to the ground where, under a shower of clods, he was forced to drop it. The egg was found intact, save for the puncture made by the Robin's bill. This seemed a clear case against the Robin and the family was condemned. Unfortunately, the sentence could not be carried out that evening, and on the following morning the two remaining Peewees' eggs were gone.

In this garden-sanctuary, the smaller species of birds, other than those that build in nesting boxes, are the victims of some enemy that takes at least fifty per cent of the first setting of eggs. On one occasion, I counted seven nests that had been rifled of their eggs since the previous day. As the well-known enemies of these birds had been banished, I was forced by a process of elimination to the conclusion that the white-footed mouse was responsible for these raids, but, since I had the experience related above, it would seem that the Robin is not above suspicion as a home-breaker.

It would be a difficult matter to prove that egg-eating is a habit of the Robin. Egg-eating birds usually discard the egg shells and swallow only the soft embryos or the semi-liquid yolk and albumen. This material is quickly assimilated; consequently the analysis of stomach contents throws little light on this question. The enormous destruction of bird life due to the egg-eating proclivities of the Crow is known to most field naturalists, yet a recent extensive investigation of the economic status of this species, based on stomach analysis, did not furnish proof of the extent of this habit. In the case under discussion where there was the strongest circumstantial evidence that one of the parent Robins had either eaten the Peewees' eggs or else fed them to the nestlings within a few hours of their being killed careful examination of the stomachs of all five birds revealed no trace of the embryos.

The house-cat is probably responsible for more destruction of insectivorous birds than is any other of the many natural enemies that the sanctuary guardian has to contend with. Domesticated or *ferae naturae*, full fed or hungry, the cat is a bird-hunter by instinct and by choice. In a small bird-sanctuary where the natural wariness of the

bird tenants has been modified through constant human association, the cat finds profitable and easy hunting. We are told that cats can be trained not to attack birds, but my experiences have only served to strengthen my doubts of this assertion and, after my pet cat, who was sleek with good feeding, had clawed her way up the side of an out-house and dragged a sitting Mountain Blue-bird from her nest, I gave up trying to educate puss as a hopeless task and decided that she was a luxury I could not afford. However, their destructive qualities are receiving full measure of publicity in these days of enlightened bird-protection, and it is a healthy sign of progress when two of the major game associations of British Columbia propose that the cat be controlled by a license system.

The House Wren, in this sanctuary, has proved himself an irresponsible and immoral little vagabond. When he first comes in the spring, and, perched on the ledge of my bedroom window, trills a clear bubbling ecstasy of song, it is hard to realize at these moments that many of his ways are evil and that his presence in the sanctuary is taboo. But I know him of old. He will beglamour me with his song and his merry ways in the intervals of stuffing the bird-houses full of twigs until the entrances are blocked. And then, after he has secured a mate and they have selected a bird-house for their housekeeping, and after I have laboriously cleaned out the cock nests from the other boxes and decided to give him one more chance he will repay my forbearance with his usual malevolence. For he wants every bird house and every hole where a nest can be built for his own private use and the rightful tenants will be harassed and persecuted at every opportunity. His dislike of other box-nesting birds is apparently an active instinct and much of his superfluous energy is spent in squabbling with the peaceful Tree Swallows and Blue-birds. Unless he is forcibly repressed, the little ruffian will sometimes enter their nests and pierce their eggs with his sharp bill, apparently in rage and spite, as he does not eat the eggs. For two successive summers I was absent during the early part of the breeding season, and, on my return, found three pairs of House Wrens in possession and the remaining seven bird-houses stuffed so full of twigs that the entrances were impassable. It was obvious that the Swallows and Blue-birds required the aid of a human ally to withstand the aggressions of the House Wren, and, as seven or eight pairs of the former are thought preferable to three pairs of Wrens and a litter of twigs in empty bird-houses, such assistance has not been withheld since that time.

THE FRESH-WATER LEECHES (HIRUDINEA) OF SOUTHERN CANADA

BY J. PERCY MOORE

(*Continued from Vol. XXXVI, page 11.*)

Hæmopis grandis (Verrill).

"Blue Sea Lake, Quebec, September 28, 1919. R. M. Anderson. Clinging to keel of boat." One specimen. The vestigeal jaws bear an apical double fold but no trace of teeth.

"On dead pike (*Esox lucius*), Rideau River, Ottawa, Ontario, April 6, 1917. F. Johansen." The single exampie was dissected. The reproductive organs present some peculiarities. Both atrium and vagina lie to the right of the nerve cord. The epididymis is unusually massive and lies along the entire length of the sperm-sac. The much emarged vagina reaches to ganglion XVI, the posterior half being greatly inflated and the much crowded and folded anterior half being only one-third to one-eighth its diameter.

"Rideau River, near Ottawa, Ontario, May 15, 1918. P. Blakeley." An immaculate individual with a distinct and continuous marginal yellowish stripe.

"Rideau River, Ottawa, Ontario, October 12, 1919. W. K. Bentley." A very pale specimen, smoke-gray above, ashy-gray below, with a rather distinct yellowish marginal stripe.

"Rideau River, Ottawa, Ontario, middle of May, 1919. E. M. Kindle." One, unspotted.

"Kapuskasing River (Moose River), Ontario, July 8, 1919. C. E. Johnson." A young one 16.5 mm. long. Dorsum smoke-gray thickly speckled with irregular black spots sometimes confluent. Venter light gray, immaculate except near the margins, where there are a few black spots.

"Cross Lake, Manitoba, summer, 1919. F. J. Alcock." One.

"Probably from lakes in Alberta and Saskatchewan, 1894. John Macoun." One, with *H. marmoratis*.

ERPOBDELLIDÆ.

Erpobdella punctata (Leidy)

"Elmsdale, Nova Scotia, July 2, 1920, May 23-28, 1921. A. H. Leim." A small example dredged in shallow water at each station.

"Amherst, Magdalen Islands, Quebec, middle of July, 1917. F. Johansen." Three small examples.

"McKay Lake, Ottawa, Ontario, September 22, 1918. F. Johansen." One.

"Ottawa River, near Hull, Quebec, October 13, 1918. F. Johansen." One with *D. parva* and *G. complanata*.

"Bight of Ottawa River (Hull Park), Quebec, July 6 and 7, 1919." One small leech and one egg capsule; with *G. heteroclitus*.

"Stream near Chelsea Road, Hull, Quebec, May 9, 1920. F. Johansen." Three specimens medium size and typical coloration.

"Ottawa River, at Interprovincial Bridge, Hull, Quebec, May 30, 1920. F. Johansen." One, with genital pores separated by three annuli.

"Lake at Cochrane, Ontario, June 21, 1920. F. Johansen." One ,of medium size.

"Solomon Lake (near Yarmouth), Nova Scotia, October 4, 1920. A. G. Huntsman." One small, very dark example.

"Pond on fields at Moose Factory, Ontario, July 14-15, 1920. F. Johansen." One small specimen, with the black spots limited to the paramedian series.

"A. N. S. No. 1131, Long Point, Ontario, September 24, 1899. Reighard."

"A. N. S. No. 1132, Rondeau Harbor, East Swamp, Ontario, August 28, 1899."

"A.N.S. No. 3400, near Wiarton, Georgian Bay, Ontario, July 12, 1915. A. B. Klugh."

Erpobdella punctata subspecies *annulata* nov.

Form similar to *E. punctata*, but in extension rather more slender and terete; in contraction similarly depressed and with sharp borders posteriorly as in that species. Size medium, the available specimens not exceeding two inches in length. The type has the following measurements. Length 42 mm., to clitellum 6 mm., of clitellum 8 mm. Width just anterior to clitellum 1.7 mm., width at male orifice 3 mm., width midway between clitellum and caudal end 2.2 mm.

Annulation, position of eyes, genital orifices and nephridiopores exactly as in *E. punctata*. Dissections show that the reproductive organs are identical with those of *E. punctata* and sections that the muscular coats are equally thick.

On the dorsum the ground color is olive brown; on the venter abruptly much paler, inclining to yellow and strictly immaculate. Dorsally the lip is dusky and is followed by an area on the posterior part of the head that is paler and without definite markings but with a suffused duskiness. Following this the remainder of the dorsum to the anus is strongly and conspicuously barred with black. Each annulus bears a heavy but irregular transverse bar lying somewhat nearer to the cephalic border. In most cases this continues across the middle line but there becomes somewhat narrower, giving the effect of a pale median longitudinal stripe. Toward the margins also of some specimens the bars may become incised, in which case they end laterally as deep black spots. The cutaneous sense organs appear as minute pale points on the dark background but they are too small to break up the black bars as in typical *punctata*. Caudal of the anus and on the sucker black pigment is scanty, occurring chiefly as lines on the radiating ridges.

E. annulata has been known to me since 1899 when Professor Trevor Kincaid sent me a small collection of leeches from Lake Washington, near Seattle, which included twenty-two specimens of this form. It was dissected and studied at that time and most of this description written but never published. The type is No. 3885 of the collection of the Academy of Natural Sciences of Philadelphia.

It is clearly a well-marked geographical race or subspecies of *E. punctata* from which it differs in the very dense pigmentation and strikingly cross banded or annulate pattern. None of the upwards of fifty specimens examined equals the largest of *E .punctata* and it may prove that smaller size and more slender form are among its characteristics. No structural differences have been detected and while it is easy to separate fresh, unfaded specimens it is probable that bleached museum specimens of the two forms could not be distinguished.

Geographically, *E. annulata* replaces typical *E. punctata* in the humid Pacific region of Washington, Oregon and British Columbia, and some approach to the type is found along the northern border states.

In this collection, the form is represented from Vancouver. "Ucluelet, Vancouver Island, B.C., June, 1909. W. Spreadborough. Fresh water."

There are twelve specimens, all immature, but with developed clitellum. All are contracted, with somewhat depressed form but margins not very sharp except for the caudal flanges. They vary in size from 18 by 2.8 millimeters to 28 by 4 millimeters, the extreme width in all cases being close to the caudal end. The first pair of eyes usually shows distinctly, but the second and third are obscure. All have the pigment somewhat faded but with few exceptions the annulate pattern is distinct. In some the bars extend the full width of the dorsum, but in most they are sharply divided into halves by a median paler stripe.

Nephelopsis obscura (Verrill).

"Near Beaver Lake, Alberta, summer, 1907. A. Halkett." Two specimens, one 19 mm. long, thickly sprinkled with fine small black spots on a light clay color background; the other about twice the size and shrunken through drying. With *P. rugosa* and *H. marmorata*.

"Jasper Park, Alberta, summer, 1919. W. Spreadborough." Four much spotted specimens.

Miss Ryerson has recorded a large number of this species from Georgian Bay. In a bottle from Pembroke Lake, Cape Breton Island, are several egg cases resembling those of this species.

"Loch Lomond (near St. John), New Brunswick, October 7, 1920. A. G. Huntsman." Two small specimens, one thickly, one sparsely spotted, and two egg-cases.

"Pond on fields at Moose Factory, Ontario, July 14-15, 1920. F. Johansen." Three medium sized, sparsely spotted specimens, and two egg-cases.

"Missinaibi River, Ontario (between Mattice and Opazatika River), June 24, 1920. F. Johansen." Two small specimens, with well-developed clitella. One measures 46 mm. long and is thickly blotched, the other 64 mm. and is marked with scattered blotches on a yellowish ground.

Dina parva (Moore).

"Ottawa River, near Hull, Quebec, October 13, 1918. F. Johansen." Twelve specimens, none exceeding an inch in length. No pigment. Sex pores separated by three and one-half annuli. With *G. complanata* and *E. punctata*.

"Lake Deschenes, Ottawa, Ontario, July 10, 1919, W. K. Bentley." One young specimen 14 mm. long. Eyes distinctly four pairs. Obscurely clouded with pigment dorsally.

"Stream-pool at St. Foye Monument, Quebec City, Quebec, September 19, 1919. F. Johansen." One specimen 15 mm. long, contracted. Nearly uniform grayish, darker above where there appear to be some scattered flecks of pigment. Eyes eight, the first two pairs quite distinct.

"Catfish Bay, Hull, Quebec, May 16, 1920. F. Johansen." One typical example.

"Pool at Catfish Bay, Hull, Quebec, May 16, 1920. F. Johansen." One with the genital orifices separated by only two and one-half annuli.

"A. N. S. No. 3401, Cataraqui River, Kingston, Ontario, October, 1915. A. B. Klugh."

This species has not been reported previously from Canada.

Dina fervida (Verrill).

"Elmsdale, Nova Scotia, June 14, 1920. A. H. Leim." A small specimen somewhat doubtfully referred to this species.

"A. N. S. Nos.1137-8, Long Point, Ontario, August 18, 1899."

"A. N. S. No. 1142, Long Point, Ontario, August 21, 1899."

"A. N. S. Nos. 1139-40, Rondeau Harbor, August 28, 1899."

"A. N. S. No. 3402, Cataraqui River, Kingston, Ontario, October, 1915. A. B. Klugh."

Not in the Ottawa collection, nor reported by Miss Ryerson, but abundant in Professor Reighard's Lake Erie collection.

AUTOBIOGRAPHY OF THE LATE PROF. JOHN MACOUN

TO BE PUBLISHED AS A MEMORIAL VOLUME BY THE OTTAWA FIELD-NATURALISTS' CLUB

Members of the Ottawa Field Naturalists' Club will be pleased to learn that the Club has made arrangements to publish the autobiography of the late Prof. John Macoun, Assistant Director and Naturalist to the Geological Survey of Canada. As the volume will be sold by subscription it will be necessary to have a sufficient number of subscribers to pay for its publication before the order is given to the publishers Hence, those who desire a copy should notify Mr. Arthur Gibson, Dominion Entomologist and Treasurer of the Macoun Memorial Committee, Birks Building, Ottawa, without delay. The price of the volume, which will be one of between 300 and 400 pages, will be $3.00. Further information will be found in the prospectus which has been sent to each member of the Club.

This autobiography was written by Prof. Macoun while residing at Sidney, Vancouver Island, B.C., and he was still engaged upon it when the illness which resulted in his death on July 18, 1920, brought it to a close; but he succeeded in bringing the history of his life to within a few years of his death.

Those who knew Prof. Macoun will not need to be told that his autobiography will have the personality of the writer of it emphasized in it. Prof. Macoun had a style all his own, two of the characteristics being directness and frankness.

The following brief outline of Prof. Macoun's work and travels will give some idea of what may be expected in this memorial volume.

Soon after his arrival in Canada in 1850 he began the study of botany, and in a few years

was a recognized authority on Canadian plants. He was chosen by Mr. Sanford Fleming to be botanist to the expedition which crossed Western Canada to the Pacific Coast in 1872, searching for a route for the Canadian Pacific Railway. The party was divided at Edmonton, and Mr. Macoun proceeded north-west to the Peace River, then across the mountains to the coast. The account of this expedition with its far reaching results was published in *Ocean to Ocean* by the late Principal Grant.

In 1875 he crossed the mountains again from the west, eventually reaching the Peace River, and from Fort St. John, with one companion, paddled down the Peace for 700 miles in a dugout canoe, and after great hardships continued east via the Athabasca River and various lakes and smaller rivers, then across country to Winnipeg, and on to Ontario. He travelled on this trip alone about 8,000 miles. His report on the country traversed was published in the Railway Report for 1877, and created much interest throughout Canada and was notably influential in the settlement of the North-West.

In 1879, he made a further extensive exploration of the prairies, and his glowing reports on the value of the North-West for wheat raising and his numerous lectures on this subject did much to awaken an interest in the west and to set emigration in that direction. He also corrected many erroneous opinions in regard to the climate and soil of the prairies. He continued his explorations on the prairies in 1880, 1881 and later, and in his book "Manitoba and the Great North-West," published in 1881, he brought together a vast amount of information in regard to the country.

In every succeeding year down to 1911 he was exploring and collecting in some part of Canada, and his knowledge of the Dominion became very great.

On his appointment to the Geological Survey, in 1882, he severed his connection with Albert College and moved to Ottawa; from that time until his death he was continuously in the service of the Dominion Government. In 1887, he was appointed Assistant Director and Naturalist to the Geological Survey, which position he held until his death. Prof. Macoun was an all round naturalist and became a first authority on Canadian plant and animal life.

His explorations and expeditions were filled with incidents and episodes of a varied nature. Some of his reminiscences were of hardships, some of mishaps and some of a very amusing nature, and their narration in his autobiograph affords extremely interesting reading.

Professor Macoun, because of the time of his principal exploration on the prairies, was in close touch with the men who had most to do with deciding on the route of the Canadian Pacific Railway, and his comments on the different routes proposed and the men connected with the enterprise both from the standpoint of the Government and the Railway are very interesting.

He was a very wide reader, and was well posted on the principal events taking place in the world, but he was particularly interested in the political life of Canada, though taking little active part in politics. Incidentally his views on many public questions of the day are to be found in this volume.

MR. ARTHUR GIBSON, Dominion Entomologist (Treasurer).

DR. FRANK T. SHUTT, Assistant Director of Experimental Farms and Dominion Chemist.

MR. WILLIAM T. MACOUN, Dominion Horticulturist.

The John Macoun Memorial Committee of the Ottawa Field-Naturalists' Club, Ottawa, Canada.

BOOK REVIEW

NANTUCKET WILD FLOWERS, by Alice O. Albertson, Curator of the Nantucket Maria Mitchell Association; illustrated by Anne Hinchman; G. P. Putnam's Sons, New York and London.

This is a volume of 442 pages of a size to fit the pocket. It was prepared specially for those who desire a more intimate knowledge of the wild flowers of Nantucket. The island of Nantucket, thirty miles at sea, is a happy hunting ground for botanists. The book has been written to describe with all possible accuracy and few technicalities the representative trees and flowers. It will be found of course of particular interest to residents of Nantucket, but students of distribution will also find it of value. Keys at the beginning of the book will assist in the identification of unknown specimens. The volume is well illustrated, showing character of leaves, etc. Coloured plates are interspersed throughout the volume. Altogether the book is an interesting one and should be much appreciated by those who have an opportunity of studying the flora of the locality for which it is specially intended.

A. G.

The Canadian Field-Naturalist

VOL. XXXVI OTTAWA, ONT., MARCH, 1922. No. 3

MANITOBA GRASSHOPPERS

By Norman Criddle, Dominion Entomological Laboratory, Treesbank, Manitoba.

Grasshoppers are members of the Order Orthoptera, and, in this article, are recognized as comprising that portion of it known as the Saltatoria. They are separated from all other members of the order by the specialized hind legs which are much larger than the other four and enable the insects to hop as well as walk in the ordinary way. They are the true grasshoppers as separated from the Earwigs, Cockroaches, Mantids and Walking-stick insects, all of which have legs that are of approximately the same size.

The grasshoppers, as above defined, may be divided into the following four families: Tettigoniidæ or Long-horned Grasshoppers; Gryllidæ or Crickets; Acrididæ or Short-horned Grasshoppers and Acrydiidæ called Grouse or Pygmy Locusts. The following brief key will separate these families in our territory:

1. Pronotum not greatly extending backwards.
A. Antennæ long, usually much exceeding the body in length.
b. Tarsi four-jointed . . .Tettigonidæ.
bb. Tarsi mostly three-jointed, middle ones always so. Gryllidæ.
AA. Antennæ not exceeding length of body. Acrididæ.
2. Pronotum extending well back over the abdomen. Acrydiidæ.

The Tettigonidae are distinguished from nearly all other families of Orthoptera by their very long feelers, in which character crickets alone resemble them. From the crickets they may be separated by the four-jointed tarsi and in having, in the females, a flat knife-like ovipositor instead of a round spear-shaped one. There are other characters of separation, but those mentioned are sufficient for the present occasion. The family includes the Katydids, Coneheads and Camel Crickets, the first two being usually green and the last dull in color, without wings.

It is to the Katydids and Coneheads that we owe most for the insect music of late summer. They have, however, close competitors in the crickets.

The Gryllidae include the cricket made famous by Dickens, the species he refers to having been introduced into this country some years ago. In addition we have a number of native species, all darker in color but fully equal to the domestic cricket in musical abilities.

The Gryllidae are divided into a number of sub-families, the most important of which, in our territory, are the Gryllinae and Œcanthinae (Ground Crickets and Tree Crickets). These may be differentiated in the following manner:

Head short, vertical, ocelli present, color black or brown.—Gryllinae.

Head elongate, horizontal, ocelli absent, color green or whitish.—Œcanthinae.

Our species of the sub-family Gryllinae are all ground-loving insects which delight to hide under any convenient object, as well as in grain stooks, hay cocks or stacks. When none of these are convenient they dig small burrows in which they live. We have two genera in Manitoba, one embracing the common large crickets and the other known as *Nemobius* containing very similar insects of less than half the other's size. The large ones contain two sub-species, namely: *Gryllus luctuosus*, the Fall Cricket, and *G. pennsylvanicus*, the Spring Cricket.

The last named winters as a nymph and is fully developed by the end of May. The other appears in July, developing from over-wintering eggs.

Apparently we have but one species of *Nemobius;* it is extremely common, being found nearly everywhere on both high and low land. Ground crickets lay their eggs in the soil like grasshoppers proper, but they do not place them in a sac. The eggs are narrow, cylindrical objects and shiny whitish in color. We found them in great abundance during the fall of 1921 wherever the land was at all sandy; the adults had been very numerous previously and caused no little apprehension in some parts.

The Œcanthinae or Tree Crickets are quite unlike the Ground Crickets, all being greenish in

color, slender in build and frequenters of vegetation such as flowers and shrubs rather than of the ground. We have but one species in Manitoba, the Raspberry-cane Tree Cricket (*Oecanthus nigricornis*), so called from the damage it does to cultivated raspberry canes while egg laying. In reality, nearly any kind of hard-stemmed plant is utilized for laying eggs in, the eggs being placed in small slits made in the bark by means of the insect's ovipositor. The practice of ovipositing in the bark of trees, etc., seems to be to protect the eggs only, as the young feed upon leaves. Nevertheless, the habit is very detrimental and often results in serious damage being done to the stems of small fruit shrubs. In Manitoba the wild rose is one of the most frequently used plants.

ACRIDIDAE

The Acrididae or true locusts are the most conspicuous of our grasshopper fauna and among them are those that are recognized the world over as pests of growing crops. One species, doubtless belonging to the genus *Acridium*, probably constituted the sixth plague of Egypt. Africa, Asia and South America all have their plagues, which, at times, come in such numbers as to darken the sky, and, with voracious appetites, clean up every vestige of vegetation in the districts visited. We have our destructive kinds here which at times attain very large proportions. In 1819 they cleaned up the crops of some of our first settlers in the Lord Selkirk Settlement; in 1871-75 the whole country seemed to be infested with them, and the old settlers can still recall the flights that fell like snow from a clear sky, dropping like a scourge upon the land beneath. They can remember, too, the heaps of dead and dying even over the land that is in the heart of Winnipeg today. These were the Rocky Mountain Locusts which came from climes adjacent to the Rocky Mountains, their original breeding-ground. Dryness and favorable winds multiplied and brought them to our country, but eventually our climate proved unsuitable and they either died or flew elsewhere.

There was a smaller outbreak of the Rocky Mountain Locust in 1890 and yet another from 1900 to 1903, but that was the last and they have not been seen in our territory since. The insect is very rare now and some authorities think it has become extinct, but this hardly seems probable. Possibly, in the future, we may have other invasions, but if we do we shall be prepared and will know how to deal with them.

While the old Rocky Mountain Locust has vanished from our province, we have others that are natives which, at times, develop into important pests. There has been an instance of this during the last three years, when considerable damage was done to crops, but the loss is not as it would have been in the past. Efficient remedies have been devised since then which enable us to cope with the insects successfully. Probably few people recognize how much has been done in the way of grasshopper fighting during these last three years, nor might they credit the fact that poisoned bait has, in some instances, accounted for a death rate of more than 200 bushels of grasshoppers to the acre.

The Acrididae are usually separated into three sub-families: the Acridinae (*Tryxalinae*), Œdipodinae and Locustinae. There is no very strict line of demarcation between these, so I will not go into details. The Acridinae are all clear-winged grasshoppers with a rather slanting face. They seldom occur in injurious numbers.

The Œdipodinae, on the other hand, nearly always have some coloring in their wings such as yellow, red or black, while frequently the hind wings are gorgeously colored so that the insects may be mistaken for a butterfly when on the wing. In addition, the face is almost vertical instead of slanting backwards. The sub-family contains some of our largest locusts, such as members of the genus *Xanthippus* and the well known Carolina Grasshopper, which has black inner wings bordered with yellow. Many of the species, too, are very noisy, giving forth a loud crackling sound as they fly.

Not many of the Œdipodinae are of marked economic importance but they are all grass feeders and, therefore, have only to become sufficiently numerous to turn into pests. One of them has already done so on our prairies, namely the Roadside Grasshopper (*Camnula*). This is one of the few pale-winged forms, though most specimens show a distinct yellowish tinge. The species derives its name from its habit of depositing its eggs in the sod-land along roadways, though it also lays freely in other sodded areas. It differs from other injurious species in depositing its eggs amid clumps of grass instead of in small bare spots. The fact that the Roadside Grasshopper is somewhat particular as to where it lays its eggs often results in the insects bunching up on suitable sod until such places are literally crowded with eggs. So thick do they become that we have counted more than 3,000 to a square foot of sod.

The Locustinae are told from the other sub-families by the presence of a spine-like wart on the prosternum between the front pair of legs. All our species have clear whitish wings. It is to this sub-family that the Rocky Mountain, the

Red-legged, Lesser-migratory and Two-striped Locusts belong, as well as most of the injurious species of other countries. Among them are to be found most of the kinds that migrate long distances, often in large swarms. It is a remarkable sight to see them on a sunny, moderately windy day suddenly rise in circles, up, up until they feel the wind sufficiently strong to bear them away, when away they go facing the wind, but carried away by its strength.

ACRYDIIDAE

Grouse Locusts are among the smallest winged grasshoppers known in this country and their size, combined with their inconspicuous coloration, makes them less known than any other family. We have at least four species in Manitoba, all of which are to be met with in low-lying situations or in semi-open woods. They are somewhat diversified in habits, some kinds wintering as adults, others as nymphs of eggs.

Grouse Locusts, like the Acrididae, deposit their eggs in sacs or pods which are placed in the ground. The female when she is ready for egg laying works the top of her abdomen into the ground by the aid of the horn-like valves which open and shut as she forces her body downwards. Eventually getting deep enough, she begins to lay her elongate eggs one at a time, forming a glutenous substance around them as she proceeds, When about 14 eggs have been deposited the grasshopper carefully covers the opening by kicking and drawing small particles of soil over it, then, having hidden all traces of her work, she hops actively away.

The food of Grouse Locusts consists of various lichens and other vegetable matter found near the ground. So far as we know this family is of no particular economic importance.

I have already dealt in part with the life histories while reviewing the different sub-families, but it may be interesting to give a more detailed account of one of the commoner species of Locustinae.

The time at which the small hoppers emerge from the eggs varies in the different kinds; some appear in the fall and winter in the nymph stage; others winter as eggs and do not emerge until the warmth of approaching summer insures abundance of succulent vegetation. All our injurious kinds have this last habit and their emergence would almost seem as if it were timed to coincide with the appearance of the farmers' grain crops. As I said before, the eggs are laid in the soil and the situation selected for them is chosen with great care. Indeed, I have known a female grasshopper seek for more than an hour before she became satisfied with the situation and commenced to work her abdomen into the ground.

When the tiny hopper is ready to emerge it breaks through the egg and begins to work its way upwards by wriggling. If the egg be covered a couple of inches or more by soil, the struggle to emerge is quite a long one, but it is really remarkable how much the insects can get through by steady shoving, So, eventually, the hopper finds itself upon the surface, a colorless object, seemingly so exhausted that it lies on its side and, metaphorically speaking, gasps for breath. Just when one wonders whether it is going to recover at all, there is a movement of returning animation, the skin splits behind the head and soon the hopper is seen casting its skin as one might expect a small boy to get out of a very tightly-fitting suit. The skin is gradually pushed downwards as the hopper wriggles out until at last only the hind legs remain encased. Another effort and one leg is free; the rest is child's play. The hopper now rests, again rather exhausted, but a change soon begins to take place. The new skin, which was pinkish or whitish at first, slowly colors to the shade characteristic of the species, gray, black or green, as the case may be. The work, however, that the hopper has gone through has been tiring, and so the insect seeks a sheltered spot where it can sun itself and rest. It goes to bed at night beneath some convenient herbage and does not think of food until the second day. First there is a mere nibble of some succulent grass blade, but food and sunlight soon create a greater appetite for more food, growth being a natural outcome. In the course of about eight days our hopper has grown too large for its coat, so it sets to work to grow a new one beneath the old one. As soon as this is ready the insect crawls up a convenient stem and obtaining a firm foothold with all its legs, with the head downwards, slowly commences the operation of skin casting. Careful watch will reveal violent contortions and muscular protuberances along the pronotum. Soon the antennae sink below the eyes and the skin splits along the back. From this point the old skin is slowly left behind as the hopper wriggles out of it, Eventually, just as one expects the hanging hopper to drop, it makes a violent swinging motion and clutches hold of the stem its old skin is attached to and at the same time draws itself free. The hopper now turns head upwards and remains inactive until the new skin hardens and assumes the coloring characteristic of the species. The resting period, after moulting, lasts a considerable time, it being fully three hours before the insect is ready to commence feeding again. In the course of some six weeks, the hopper has cast its skin

five times, not including the hatching month. At the third moult, the wing pads become distinctly visible and with the succeeding change assume larger proportions, until, at the final moult, the insect is adorned with the wings that proclaim it fully developed. Growth is now at an end and new activities are entered into.

Flight comes first, as the now fully developed grasshopper has an instinctive desire to see the world. But there are other considerations also. The attainment of wings has provided at the same time a musical instrument for the male with which he charms his lady-love into admiration for his accomplishments.

The instinct of migration is one of the most remarkable in the animal kingdom. It seems to arise from a desire in each species to spread as far as possible over the land. It has very little to do with food supply in grasshoppers, but appears to be more an effort to prevent overcrowding, and thus escape disease and enemies of other kinds. The provision in some species is wonderful in its completeness. There are long-winged, medium-winged and short-winged ones. Think of the result; the strong-winged ones move for a field, the medium-winged to comparatively nearby places, while those with short wings remain to carry on the race close at hand.

The main period of flight begins soon after the grasshoppers obtain wings, but flying continues intermittently for more than a month. The flights always commence in bright sunshine and end as soon as the sun becomes overcast or when the shades of evening show that the day is drawing to a close.

The music of grasshoppers is usually produced by rubbing the hind legs bow-like against a specially developed object upon the wings, but in some cases the wings themselves are rubbed together. Each kind of grasshopper that can play at all has its own particular music which can be told without much difficulty from that of others. You know how crickets chirp. The Green Tree Cricket has a steady trill which is noted most in August, hence the name Harvester which is sometimes applied to this insect. The Katydid gets its name from the song it sings, "*kat-y-did.*" It is not a Manitoba insect but we have some close allies which cry "*she-sees-me*" with great persistency although it is pitch dark. For the Katydids are night singers and avoid the sun as much as the locusts seek it. The crickets are also night singers unless they find some darkened place beneath some object, in which case they sing all day as well. This music, which begins with the warmth of spring, ceases as the nights grow long and cold in autumn. There are a few kinds of Orthoptera that play on into late October, but the majority are then silent, and, as winter draws near, the music of the insect world grows mute and the lives that were so animate are cold in death.

(To be continued.)

THE SUMMER BIRDS OF ADVOCATE, CUMBERLAND COUNTY, NOVA SCOTIA

BY CHARLES W. TOWNSEND, M.D.

Nearly midway between Cape Chignecto and Cape d'Or, and washed by the tides of the Bay of Fundy as they rush in and out of the Basin of Minas, lies the little village of Advocate. Pleasantly introduced by Dr. John W. Dewis of Boston, a native of this place and a fellow ornithologist, my wife and I spent here the last few days of June and the first three weeks of July, 1921, in searching out the birds. Our steps led us to Cape d'Or on the east and Refugee Cove near Cape Chignecto on the west. We also spent five days at Isle Haute, which was discovered by Champlain in 1604 and accurately described in his "Narrative." He says: "Heading northeast nine or ten leagues, coasting from Port Royal (Annapolis), we crossed a part of the Bay some five or six leagues in breadth to a place which we named the Cape of Two Bays (Cape Chignecto), and we passed by an island (Isle Haute) which is a league from it and which is about that distance in circumference, and is some forty or fifty fathoms in elevation. It is entirely surrounded by great rocks excepting in one place where there is a slope, at the foot of which is a pond of salt water, which lies at the base of a gravel point having the form of a spur. The top of the island is flat, covered with trees, and it has a very good spring."

Champlain also described and charted Advocate Harbor, which he called Port des Mines from the copper mines at Cape d'Or. To his attributes of explorer, cartographer and historian, that of bird-lover may be added, as the following extract from his "Narrative" shows. Speaking of his garden at Port Royal he says: "We often went there to pass the time, and it seemed as if the little birds around took pleasure in it, for they gathered there in such numbers, singing and warbling so charmingly that I do not think I

ever heard anything like it."

There are cultivated fields and dyked meadows at Advocate, but behind and on both sides back from the sea, the country is heavily forested, for the most part with red spruce and balsam fir, white and yellow birches. White spruces are common near the sea. The black spruce and sweet birch are rare and the gray birch, larch and mountain ash are not uncommon. Sugar maples and ashes are also found. The region is more boreal than the Annapolis valley through which we passed, where red oaks, white and red pines, hemlock and beeches are common. Birds of the Transition Zone seen in the latter region and not encountered in Advocate were: Wood Peewee, Least Flycatcher, Chestnut-sided Warbler, Catbird, Veery and Bluebird.

In the following list of eighty-one species, all, with the exception of the Loon, Double-crested Cormorant, Great Blue Heron and Least Sandpiper, were breeding in this region, and it is possible that these may breed there. In the previous summer I found evidence of the Least Sandpiper breeding farther south at Cape Sable Island.

1 LOON: *Gavia immer*. Few.

2 BLACK GUILLEMOT: *Cepphus grylle*. Eight or ten pairs breeding in the cliffs of Isle Haute.

3 GREAT BLACK-BACKED GULL: *Larus marinus*. Although I did not find their nests, I believe that several pairs bred at Isle Haute.

4 HERRING GULL: *Larus argentatus*. About five hundred pairs, possibly more, nested on the cliffs of Isle Haute and especially on the steep turf-clad portion of the western side. Here the nests were, for the most part, in depressions of the turf and destitute of nesting material. On July 12 most of the young were out of the eggs and running widely on the turf, but confined within narrow limits on the ledges of the cliffs.

5. DOUBLE-CRESTED CORMORANT: *Phalacrocorax a. auritus*). Two or three seen.

6. RED-BREASTED MERGANSER : *Mergus serrator*. A pair nesting near the salt pond at Isle Haute.

7. EIDER: *Somateria mollissima dresseri*. Six or seven pairs nesting at Isle Haute. On July 14 a pair seen, the male in full nuptial plumage. On July 16 a nest with four eggs was shown me by the light-house keeper under a spruce bush on the cliff about fifty feet up. On the same day a flock of fourteen were seen, all in brown dress but two, that were only partially moulted into the eclipse plumage.

8. GREAT BLUE HERON: *Ardea herodias*. One seen.

9. LEAST SANDPIPER: *Pisobia minutila*. A few migrating flocks.

10. SPOTTED SANDPIPER: *Actitis macularius*. Common.

11. SEMIPALMATED PLOVER: *Aegialitis semipalmata*. On July 1, two pairs plainly showed by their actions that they had eggs or young on the sandy and pebbly bay of Advocate Harbor. *Vide Auk*, xxxviii, 1921, p. 601.

12. CANADA RUFFED GROUSE: *Bonasa umbellus togata*. Common.

13. BROAD-WINGED HAWK: *Buteo platypterus*. One seen on June 28.

14. OSPREY: *Pandion haliaetus carolinensis*. Two seen.

15. GREAT HORNED OWL: *Bubo v. virginianus*. On June 29, three young, fully grown and able to fly, but with heads still in the down and with downy ear tufts were seen in spruce woods. One called repeatedly a plaintive note—*ee-ah*.

16. BELTED KINGFISHER: *Ceryle alcyon*. Few seen.

17. HAIRY WOODPECKER: *Dryobates v. villosus*. Few seen.

18. DOWNY WOODPECKER: *D. pubescens medianus*. Few seen.

19. ARCTIC THREE-TOED WOODPECKER: *Picoides arcticus*. One seen on July 1.

20. NORTHERN FLICKER: *Colaptes auratus luteus*. Common.

21. CHIMNEY SWIFT: *Chaetura pelagica*. A few. A pair was found nesting in a fish house at Refugee Cove. The nest was attached to a piece of canvas nailed to the logs of the wall near the roof, and the birds entered through a stove pipe hole in the roof. There were five eggs on July 9.

22. RUBY-THROATED HUMMINGBIRD: *Archilochus colubris*. A few.

23. KINGBIRD: *Tyrannus tyrannus*. Uncommon.

24. OLIVE-SIDED FLYCATCHER: *Nuttallornis borealis*. Not uncommon.

25. YELLOW-BELLIED FLYCATCHER: *Empidonax flaviventris*. Common. On July 5, I found a nest between two moss-covered logs on the ground containing several black, downy young.

26. ALDER FLYCATCHER: *E. trailli alnorum*. Uncommon.

27. CANADA JAY: *Perisoreus c. canadensis*. One seen.

28. NORTHERN RAVEN: *Corvus corax principalis*. Common. A family group of four or five at Refugee Cove and another at Isle Haute. At the latter place they undoubtedly preyed on the eggs and young of the Herring Gull.

29. CROW: *Corvus b. brachyrhynchos*. Common.

30. BOBOLINK: *Dolichonyx oryzivorus*. Few.

31. RUSTY BLACKBIRD: *Euphagus carolinus.* Few.

32. BRONZED GRACKLE: *Quiscalus quiscula aeneus.* Few.

33. PURPLE FINCH: *Carpodacus p. purpureus.* Abundant.

34. RED CROSSBILL: *Loxia curvirostra minor.* Few.

35. WHITE-WINGED CROSSBILL: *L. leucoptera.* Common.

36. GOLDFINCH: *Astragalinus t. tristis.* Common.

37. PINE SISKIN: *Spinus pinus.* Common.

38. VESPER SPARROW: *Poœcetes g. gramineus.* Few.

39. SAVANNAH SPARROW: *Passerculus sandwichensis savanna.* Abundant.

40. ACADIAN SHARP-TAILED SPARROW: *Passerherbulus nelsoni subvirgatus.* Common.

41. WHITE-THROATED SPARROW: *Zonotrichia albicollis.* Abundant.

42. CHIPPING SPARROW: *Spizella p. passerina.* Common.

43. SLATE-COLORED JUNCO: *Junco h. hyemalis.* Abundant.

44. SONG SPARROW: *Melospiza m. melodia.* Abundant.

45. LINCOLN'S SPARROW: *M. l. lincolni.* One seen on July 6.

46. SWAMP SPARROW: *M. georgiana.* Few.

47. ENGLISH SPARROW: *Passer domesticus.* All too abundant in the village.

48. CLIFF SWALLOW: *Petrochelidon l. lunifrons.* Abundant.

49. BARN SWALLOW: *Hirundo erythrogaster.* Common.

50. TREE SWALLOW: *Iridoprocne bicolor.* A few.

51. BANK SWALLOW: *Riparia riparia.* A few.

52. CEDAR WAXWING: *Bombacilla cedrorum.* Common.

53. RED-EYED VIREO: *Vireosylva olivacea.* Common.

54. BLUE-HEADED VIREO: *Lanivireo s. solitarius.* Common.

55. BLACK AND WHITE WARBLER: *Mniotilta varia.* Few.

56. NASHVILLE WARBLER: *Vermivora r. rubicapilla.* Common.

57. TENNESEE WARBLER: *V. peregrina.* Common.

58. NORTHERN PARULA WARBLER: *Compsothlypis americana usneae.* Common.

59. YELLOW WARBLER: *Dendroica a. aestiva.* Common.

60. BLACK-THROATED BLUE WARBLER: *D. c. coerulescens.* Few.

61. MYRTLE WARBLER: *D. coronata.* Abundant.

62. MAGNOLIA WARBLER: *D. magnolia.* Abundant.

63. BAY-BREASTED WARBLER: *D. castanea.* Few.

64. BLACKBURNIAN WARBLER: *D. fusca.* Few.

65. BLACK-THROATED GREEN WARBLER: *D. virens.* Abundant. One at Isle Haute sang twice a part of the song of the Tennesee Warbler.

66. YELLOW-PALM WARBLER: *D. palmarum hypochrysea.* Few.

67. OVEN-BIRD: *Seiurus aurocapillus.* Few.

68. WATER-THRUSH: *S. n. niveboracensis.* Few.

69. MOURNING WARBLER: *Opornis philadelphia.* One pair found.

70. MARYLAND YELLOW-THROAT: *Geothlypis t. trichas.* Abundant.

71. CANADA WARBLER: *Wilsonia canadensis.* Few.

72. REDSTART: *Setophaga ruticila.* Abundant.

73. WINTER WREN: *Nannus h. hiemalis.* Common.

74. BROWN CREEPER: *Certhia familiaris americana.* Few.

75. RED-BREASTED NUTHATCH: *Sitta canadensis.* Few.

76. CHICKADEE: *Penthestes a. atricapillus.* Common.

77. ACADIAN CHICKADEE: *P. h. hudsonicus.* Common.

78. GOLDEN-CROWNED KINGLET: *Regulus satrapa.* Few.

79. OLIVE-BACKED THRUSH: *Hylocichla ustulata swainsoni.* Common.

80. HERMIT THRUSH: *H. guttata pallasi.* Common.

81. ROBIN: *Planesticus migratorius.* Common.

In this brief visit a number of breeding birds were, of course, overlooked. For example, one would expect to find the Black Duck, Bittern, Canada Spruce Partridge, Marsh Hawk, Sharp-shinned Hawk, Barred Owl, Yellow-bellied Sapsucker, Nighthawk, Blue Jay, Philadelphia Vireo, Cape May Warbler, Wilson's Warbler and Ruby-crowned Kinglet.

THE RELATION OF WILD LIFE TO AGRICULTURE

BY NORMAN CRIDDLE, TREESBANK, MANITOBA

In the old days, before the arrival of the settler, when the country was one vast stretch of uncultivated land, the wild creatures roamed the plains and woods almost at will. They multiplied or decreased according to the prevailing conditions, such as were brought about by the prevalence of food and the presence or absence of natural enemies. Nature had provided that there should be a balance in all things and, therefore, while certain insects or mammals might increase unduly for a time, they were always eventually reduced by other forms which preyed upon them, or by the meteorological conditions that prevailed. Thus the gophers and mice were kept in check by hawks, owls, weasels and other predatory animals; while the insects were controlled by various parasites in conjunction with a host of birds which found in them a palatable diet. There were no violent changes then, such as is brought about by cultivation, and so the balance which nature had decreed was maintained as it is in all parts where civilized man has not set his foot.

With the advent of civilization, followed by cultivation, conditions became changed. Animals that had previously roamed the wilds in freedom were unmercifully slaughtered with such a lack of discrimination that the useful frequently suffered even more than the harmful. Hawks and owls were among the first to feel this persecution. A few injurious kinds set the farmer against them all, and, as the useful species were much more numerous than the harmful the effects were soon very striking. Rodents had previously subsisted upon wild plants and had found it difficult, at times, to find sufficient for their wants, but the introduction of farming provided an unlooked-for supply. Immediately vast stores of grain were made available and, consequently, as the food supply was now ample and the natural enemies had been killed off, rodents increased at a rate hitherto impossible, with very disastrous results to the farmer.

But this was by no means all. In addition to the rodents, there was a vast army of native insects, a number of which fed upon wild plants. These had fluctuated from time to time according to the available food supply, but the new conditions again upset the balance and, farming having provided abundance of food, the insects began to turn their attention to the new supply and soon became pests of importance. Such are the grasshoppers, Wheat-stem Sawfly and cutworms of today, while others, at present less known, threaten to add to the pests which cultivation has thrust upon us.

One more important factor must be added to those enumerated above. Among the greatest friends of man are a host of small birds many of which nest upon the ground. These, in times past, fed upon insects and wild seeds, and they were especially important in keeping the former in check. In this case cultivation again changed conditions in favour of man's enemies. The insects were able to breed as readily, or even more so, in cultivated ground, as on the original sod; but this was not so with birds which, with every acre of land broken up, were obliged to seek new breeding grounds. Thus, as man adds to his cultivated acreage he encourages the insect pests by providing more food and additional breeding places, while, at the same time, he forces his bird friends to seek nesting quarters elsewhere.

Pasturing the land has also done much to destroy bird life, especially around the margins of ponds and lakes. At the same time cropping the grass has encouraged grasshoppers. Indiscriminate setting of fires has done more still, and the burning of woodlands has caused a havoc almost unthinkable. Such is a summary of the changes which have led to our present trouble with insect and rodent pests. Man has provided for them, and man alone can reduce or keep them in check.

We have hitherto dealt only with native animals but in addition to those are a number which have been introduced from other countries. Some of these, like the House Sparrow, were brought in purposely, others have availed themselves of the channels of commerce. It frequently happens that the imported pests are even more dangerous than the native ones, because the latter have always been with us and their enemies are consequently at hand; but this is not so with introduced species which have more often left their foes behind. The new pests are, therefore, generally unhampered by enemies and consequently spread with great rapidity. Several of our worst pests are examples of this. The Hessian Fly is one, the Cabbage-worm of our gardens another. The House Mouse and Brown Rat have both been introduced, though in the case of these we have both owls and weasels to aid us in keeping them in check.

The problem of keeping out foreign pests is one that has received much attention of recent years, but its importance can hardly be over-estimated. This is especially true of insects, though the folly of indiscriminately introducing birds or mammals has also been amply demonstrated and every care should be taken to avoid a repetition of it.

A moment's thought will show that the old conditions have passed away never to return. Civilization has spread over the land almost like a pestilence, and, as it has become established in the new country, it has swept from the face of it many of the creatures that formerly dwelt there. The buffalo had to go, just as it would seem must the elk from our cultivated areas. Others may have to follow such as the wolf and coyote, but we should proceed very slowly even with the destruction of predatory animals until we can definitely ascertain what their place is in the scheme of nature. It may be difficult to exterminate but to replace is impossible. The extermination of any creature from the world in which it has won a place is a responsibility which we should consider very seriously. We should remember too, that conditions change and as they do so they alter the economic status of many things, animals included.

Much irreparable harm has already been done by thoughtless or selfish slaughter of native animals. The Passenger Pigeon has apparently gone for ever. Ruthlessly destroyed to a point where it could no longer withstand the natural enemies with which it had to contend, it has thus vanished from our fauna and left us so much poorer. Others are in danger of a similar fate. The Whooping Crane is on the point of extinction now, the Snowy Owl has dwindled to a mere remnant of its former numbers, in this case due to a mania for collecting, as a casual examination of our country hotels will show.

Before we finally decide on the destruction of any species we should remember that even predatory animals of the worst type have their uses and that they are at times actually of value in destroying some of our useful species. Among all creatures are a certain percentage which fall sick; such animals are naturally weaker than their healthy companions and for this reason they are more apt to fall prey to the carnivorous creatures on the lookout for food. The sickly grouse, flying more slowly, is caught by the Goshawk; an unhealthy deer is more readily overtaken by wolves. But in destroying these the predators are performing a useful act in as much as they are eliminating the unfit and preventing the spread of disease. Were there no animals to carry on this work, it is possible that disease would become more prevalent, and for this reason we might actually defeat the ends we had in view by exterminating predatory animals.

As we have already pointed out, the restriction of breeding areas by cultivation and grazing is a serious matter, as by it our friends the birds are often banished while our insect and rodent enemies are encouraged. These conditions are, unfortunately, apt to become worse with ground-loving birds, but with others it need not be so; and with tree-loving species, at least, there is no reason why the old balance should not be restored. To accomplish this every farmer should establish a tree belt, preferably near the farm buildings. To make the belt attractive to birds, large trees should border small ones. Deciduous trees as well as evergreens should be planted, also all the available berry-bearing shrubs whose fruit form a staple diet for many birds after the nesting season is over, or when insects become scarce. A few small boxes erected on trees or posts will form attractive nesting places for Wrens, Tree Swallows, Flickers and Blue Birds. Finally, a water trough is important for the birds to drink at and bath in. Such a plantation, with the additions mentioned, would increase the range of many of our birds and their numbers would be multiplied a hundredfold. There would be found the Catbird singing softly in the early morn, the Robin and Oriole in their attractive plumage, the Kingbird, Yellow Warbler, House Wren and many others all adding to the beauties of the landscape and the pleasures of the home. But, apart from the aesthetic side, they would prove of incalculable value as destroyers of noxious insects, thus assisting to restore the balance which man upset in the first place.

Another important factor in restoring bird life should be provided; not, however, by the individual but by the state. This consists of setting aside areas for wild life sanctuary, where the creatures within them can multiply unhampered and as they do so spread over the surrounding country to gather in the pests now so prevalent. Much has already been done along this line, but too much can hardly be accomplished. Every district should have its sanctuary as a permanent breeding centre and the farmers must understand that such areas are almost as important for their welfare as is the maintenance of their flocks. Sport must become secondary to agricultural interests and the depletion of our country of game birds, particularly grouse, should be made impossible. There should also be a greater consideration for predatory animals. The original food of coyotes, for instance, was made up largely of rabbits, gophers and mice, all of which do much

harm, the first named to our trees and the last two to our grain crops and fruit trees. Weasels formerly subsisted to a large extent upon rodents such as gophers, voles, pocket gophers, rabbits, mice and an occasional bird. Their food to-day is practically as it used to be. The number of poultry taken by these animals is a mere nothing in comparison to the noxious rodents killed; and as only one kind of weasel is known to attack poultry out of the three species found in the middle west, these animals can be justly classed as the most beneficial of all mammals found within the country. I am convinced that agricultural interests should take precedence over the fur interests in this question and that the wholesale trapping of weasels should be discouraged as not in the best interests of the community. At present weasels are not in any way protected by law in Manitoba, though mink and beavers, both much less worthy, are provided with a close season, an anomaly that can only be explained by ignorance of the comparative usefulness of the animals involved.

The persecution to which most of our predatory animals and birds have been subjected originates from the fact that there are occasions when most of them will take a barnyard fowl. Naturally, the robber is, as a rule, observed, and, as its every-day habits are not, the conclusions drawn are usually very erroneous. Besides this, truly injurious species are frequently confused with useful ones, such as, for instance, a Goshawk with Swainson's Hawk. In this example, the former being known to take chickens, the latter is suspected of doing likewise and is shot without further consideration. Here then we have need of education which might well be carried on in the schools, but in the meantime we should adapt the principle of justice whereby an animal is considered innocent until it is proved guilty.

The farmer is rapidly learning to appreciate the value of wild birds. The large flocks of Franklin's Gulls which were to be met with almost daily following the plough during 1920-21 when they gathered up such enormous numbers of grasshoppers, will long be remembered. The birds have already been spoken of as the "Farmer's Gulls," and what fitter species could be chosen as an emblem? White represents purity, its flight symbolizes gracefulness combined with strength, while its persistency in gathering up noxious insects surely indicates the acme of industry and usefulness. Birds so beneficial as these should be afforded every protection, and, above all, they should be provided with permanent breeding places from which they will continue to wander far afield in search of food. Every available lake should be made a gull sanctuary, and steps should be taken to protect the herbage growing around from live stock so that nesting sites may not be interfered with. A gull sanctuary should add considerably to the value of nearby farms and not a little to those even twenty miles away, as was amply demonstrated in 1921.

Many another bird is at work along similar lines to the gulls. Horned Larks providing a cutworm every two minutes throughout the day to their nestlings; the Crow, which has been known to gather 72 wireworms for a single meal; the Upland Plover, almost exclusively a grasshopper feeder and Meadowlarks and Grouse, whose families are largely reared on the same diet. These are but a few of the many which might be enumerated, to say nothing of those species that feed upon the pests affecting trees. But enough has surely been written to show what the facts are. Pests have increased through man's activities, largely because he provided abundance of food for them, but also because he killed or banished many of his best friends. A majority of these friends are still living in reduced numbers and with care may be induced to return. As they do so, insect outbreaks will grow less frequent and the balance will become more as it was before man upset it.

SOME OF CAPTAIN HENRY TOKE MUNN'S OBSERVATIONS ON THE BIRDS OF BAFFIN ISLAND AND VICINITY

BY HOYES LLOYD

It was recently my pleasure to discuss the bird life of the Eastern Canadian Arctic archipelago with Captain Henry Toke Munn, F.R.G.S., F.Z.S. who has had long experience in that district. As any information concerning the bird life of this vicinity is considered valuable, I was glad to have his permission to prepare for publication the notes taken during our conversation.

There is a large loomery (species ?) on Bylot Island, near Ponds Inlet, and the natives obtain the eggs of these birds to a considerable number in June. Captain Munn once watched a polar bear catching some of the adult birds from this colony. The birds were diving under the ice

floe and frequently one would approach close to where the bear had located itself. Whenever a bird came within reach the bear would capture it with one paw.

Anas platyrhynchos—MALLARD

Captain Munn once saw a female Mallard at Ponds Inlet.

Harelda hyemalis—LONG-TAILED DUCK

This species is not common in the vicinity of Bylot Island although very abundant on Southampton Island. Vast flocks were seen in the autumn there.

Somateria mollissima borealis—NORTHERN EIDER.

Eiders, undoubtedly of this sub-species, are common and breed in Eclipse Sound. There is no suitable breeding-ground for them in Ponds Inlet vicinity.

Somateria spectabilis—KING EIDER.

Common, breed in Eclipse Sound, but not in Ponds Inlet vicinity.

Chen hyperboreus nivalis—GREATER SNOW GOOSE.

Snow Geese, believed to be of this sub-species because of the locality, are abundant and breed on Bylot Island and Baffin Island in the vicinity of Ponds Inlet. Both dogs and natives hunt the flightless moulting birds for food. The Blue Goose was unknown to Captain Munn.

Branta canadensis hutchinsi—(Sub-species ?)

Captain Munn shot a *Branta canadensis* about the size of a Mallard on Southampton Island.

Grus americana—WHOOPING CRANE

Captain Munn saw two Whooping Cranes on Baffin Island near Ponds Inlet in the summer of 1912.

Grus canadensis or *Grus mexicana.*

Common on Southampton Island.

Nyctea nyctea—SNOWY OWL.

Two live specimens brought out and presented to the London Zoological Society.

Corvus corax principalis—NORTHERN RAVEN.

At least a dozen pairs of Ravens have wintered in one season in the Ponds Inlet vicinity, where the species is resident and very common. The natives believe the Raven is able to stand the severe cold because he makes an igloo. As other birds sleep under the snow this may well be the Raven's method of withstanding severe weather.

PROSECUTIONS

Migratory Birds Convention Act and Northwest Game Act, by Officers of the Dominion Parks Branch and Royal Canadian Mounted Police.

MIGRATORY BIRDS CONVENTION ACT

REPORTED DURING THE PERIOD—OCTOBER 24, 1921—FEBRUARY 15, 1922.

Joseph Lachance, S.S. "Rouville", Quebec. Killing a Herring Gull. Fine $10.00 and costs.

Joseph Lachance, S.S. "Rouville", Quebec. Obstructing a Game Officer in the discharge of his duty. Fine $10.00 and costs.

Edward O. Barber, Alberton, Prince Edward Island. Selling Ducks. Fine $10.00 and costs.

Thomas Brodrick, Alberton, Prince Edward Island. Having Ducks exposed for sale. Fine $10.00 and costs.

Hunter Weeks, Alberton, Prince Edward Island. Buying Ducks. Fine $10.00 and costs.

Russell Oulton, Alberton, Prince Edward Island. Trafficking in Ducks. Fine $10.00 and costs.

A. E. Holt, Erskine, Alberta. Killing Loons in close season. Fine $10.00 and costs.

Russell Hirtle, Oakland, Lunenburg County, Nova Scotia. Having in possession a Great Blue Heron. Fine $10.00 and costs.

Clyde Hirtle, Big Tancook Island, Lunenburg County, Nova Scotia. Shooting Coots in close season. Fine $30.00 and costs.

Garnet Young, Big Tancook Island, Lunenburg County, Nova Scotia. Shooting Coots in close season. Fine $30.00 and costs.

Captain Mercier, S.S. "Rouville", Quebec. Obstructing a Game Officer in the discharge of his duties. Withdrawn.

Joseph Tremblay, St. Agnace St., Chicoutimi, Quebec. Having in possession a Robin. Fine $10.00 and costs.

Rufus Nieforth, Halifax, Nova Scotia. Ducks exposed for sale. Fine $10.00 and costs.

Beatrice Nieforth (Mrs.), Halifax, Nova Scotia, Ducks exposed for sale. Fine $10.00 and costs.

Joseph Dumphy, Halifax, Nova Scotia. Ducks exposed for sale. Fine $10.00 and costs.

Richard Carter. Halifax, Nova Scotia. Ducks exposed for sale. Fine $10.00 and costs.

Allan Menzie, Dalhousie Junction, Restigouche County, New Brunswick. Attempting to kill migratory game birds between 9 p.m. and 12 p.m. Seizure: one shot-gun. Fine $20.00 and costs.

Irving Menzie, Dalhousie Junction, Restigouche County, New Brunswick. Furnishing false information to a Game Officer. Seizure: one shotgun. Fine $20.00 and costs.

Thomas Williams, Musquodoboit Harbour, Halifax County, Nova Scotia. Selling Ducks. Fine $10.00 and costs.

Frederick Bowser, Musquodoboit Harbour, Nova Scotia. Selling Ducks. Fine $10.00 and costs.

Allan Menzie, Dalhousie Junction, Restigouche County, New Brunswick. Attempting to kill migratory birds by the use of a "night light." Fine $20.00 and costs.

Irving Menzie, Dalhousie Junction, Restigouche County, New Brunswick. Attempting to kill migratory birds by the use of a "night light." Fine $20.00 and costs.

Irving Menzie, Dalhousie Junction, Restigouche County, New Brunswick. Attempting to kill migratory birds between the hours of 9 p.m. and midnight. Fine $20.00 and costs.

Dominique J. Mallet, Shippigan, New Brunswick. Having in possession a Canada Goose. Fine $10.00 and costs.

David Saunders, Yarmouth, Nova Scotia. Having Ducks for sale. Fine $10.00 and costs.

Clement Pitman, Proprietor People's Market, Yarmouth, Nova Scotia. Having ducks for sale. Fine $10.00 and costs.

John S. Cyr, St. Leonard, New Brunswick. Having in possession a Great Blue Heron. Fine $10.00 and costs.

Robert Bishop, Greenwich, Nova Scotia. Killing one Hudsonian Curlew. Fine $10.00 and costs. (Suspended).

A. E. Booth, 1684 8th Ave. W., Vancouver, British Columbia. Having in possession a Duck in close season. Fine $10.00 and costs.

N. Routley, 55 10th Ave. W., Vancouver, British Columbia. Having in possession a Flicker in close season. Suspended Sentence.

W. Viau, 337 Amherst St., Montreal, Quebec. Having in possession a portion of skin and plumage of a Loon. Fine $10.00 and costs.

Dumouchel & Cockburn, 12 Craig St. E., Montreal, Quebec. Receiving a Pileated Woodpecker which had been illegally killed. Fine $10.00 and costs.

A. E. Houle, 288 Christopher Columbus St., Montreal, Quebec. Having in possession a portion of the skin and plumage of a Loon. Fine $10.00 and costs.

A RESOLUTION BEARING ON THE INTRODUCTION OF NON-NATIVE PLANTS AND ANIMALS INTO THE NATIONAL PARKS OF THE UNITED STATES

WHEREAS, One of the primary duties of the National Park Service is to pass on to future generations for scientific study and education, natural areas on which the native flora and fauna may be found undisturbed by outside agencies; and

WHEREAS, The planting of non-native trees, shrubs or other plants, the stocking of waters with non-native fish, or the liberating of game animals not native to the region, impairs or destroys the natural conditions and native wilderness of the parks:

BE IT RESOLVED, That the American Association for the Advancement of Science strongly opposes the introduction of non-native plants and animals into the national parks and all other unessential interference with natural conditions, and urges the National Park Service to prohibit all such introductions and interference.

EDITORIAL

PRESERVE THE NATIONAL PARKS

Certain areas in various parts of Canada, including some of the most beautiful and attractive regions in the western mountain ranges, have been set aside as Canadian National Parks and are being maintained as such. The Parks thus wisely created, if maintained intact, will provide for present and future generations unmarred and inspiring examples of our wild life and wonderful scenery. The Canadian people will be always the better because of their possession and enjoyment of these great, health-giving out-of-doors playgrounds. The benefit conferred in this way will increase continually as the Dominion becomes more and more settled.

Canada's National Parks are of great value also because of the world-wide advertisement which they give to some of the prominent natural features of the Dominion and because they are the means of bringing, through the tourist travel which they attract, a large and increasing revenue to this country. Such names as Banff and Lake Louise

are heard the world around.

Attacks by private commercial interests, such as in recent years have been made repeatedly upon the National Parks of the United States, are undoubtedly to be expected in Canada also. Such attacks are usually disguised so as to make it appear that, as water-power or irrigation projects, they are in the public interest. The most innocent-looking and least harmful project may be put forward at first, in the hope of creating a precedent which may be used for the fullest exploitation of the natural resources of the Parks.

An abundance of water is available outside of our Parks for purposes of irrigation and water-power development. The great incentive to carrying out projects of this sort inside a National Park rather than elsewhere is the hope of the private interests concerned that they may be relieved of the necessity of paying for lands flooded and other damage done, which would not be the case if the damage were done to privately-owned property outside of a Park. Attempts at commercial development and exploitation of Park areas are attempts of private and local interests to reap abnormal profits by destroying and disfiguring the property of all the people of the Dominion.

If even one commercial project should succeed in becoming established in Canada's National Park system, the way would be opened for endless spoliation, which would render the Parks useless for the purposes for which they were set aside. All who are interested in the preservation for the public use and enjoyment of the grand natural beauties and the wild life of Canada's most attractive regions should watch carefully for any attack upon the National Parks, and should be prepared to co-operate fully in bringing the sentiment of the people at large to bear to prevent private inroads upon their property. An informed public sentiment is the only effective means of meeting powerful private attacks upon the public interests. Preserve the National Parks!

REVIEWS

THE CONDOR FOR 1921.

No. 1, JANUARY—FEBRUARY.

Suggestions regarding the Systema Avium. By Richard McGregor, pp. 15-18.

This is a discussion of a new Check List now under consideration that is planned as a Nearctic volume to a Systema Avium. Other volumes covering other geographic divisions are to be prepared by British ornithologists. The suggestions are interesting and demand full consideration in this difficult compromise of conflicting ideas. Whether all the proposals are to be adopted or not, these ideas of a broad-minded worker may assist in clarifying the problem.

Concerning the Status of the Supposed Two Races of the Long Billed Curlew. By Joseph Grinnell, pp. 21-27.

This is a discussion of the tenability of the new race described by Bishop (*Auk.* XXVII, 1910, pp. 59-60), and upheld by both Oberholser and Ridgway. The question as to whether *parvus* Bishop or *occidentalis* Woodhouse is the proper name for this form is passed over as immaterial in the discussion, only the validity of the subspecies itself being brought into question. The investigation is based upon a series of the species made in San-Luis Obispo County, California. After a large series of measurements (the form is separated entirely on size) and some interesting illustrative graphs, Dr. Grinnell decides that they show a gradual series of gradations without any tendency towards grouping at the extremes, and the grounds of subspecific differentiation are, therefore, too slight for nomenclatural recognition. This, from such a refined "splitter" as Dr. Grinnell, carries unusual weight. In connection with this question the present reviewer might call attention to two sets of eggs of this species in the Victoria Memorial Museum, differing in size sufficiently to represent the two proposed races, but obviously from geographical considerations both belonging to the postulated smaller one. A typical egg from a set collected by W. Raine, 10 miles south of Lake Rush, Saskatchewan, June 2, 1894, measures 2.8 x 1.9 inches. A typical egg from the other set collected by P. A. Taverner at Cypress Lake, Saskatchewan, May 24, 1921, measures 2.56 x 1.78 inches. It is taken for granted that they were laid by comparably sized birds. These two sizes from one field near the extreme extension of the range of one form largely supports Dr. Grinnell's contention.

The larger a species and the more extreme its specialization, the greater is the expected individual and age variation. This is especially so in species that may be regarded as overgrown members of their family. The Long-billed Curlew is enormous for a wader, and its bill, especially lengthened and departing far from the ancestral type, grows for a considerable period after apparent maturity and is subject to great variation. The Canadian prairie provinces covering the ranges of the species are today well settled in comparison with much of the bird's range in the

south. The bird has also suffered considerably from its contact with settlement, as would be expected of a large palatable bird so easy to approach in its breeding season. Its individual expectancy of life and the relative number of very old specimens in proportion to population have become considerably reduced in these northern areas. It is to be expected that the average of specimens collected today in this section would measure smaller than in more southern areas where there are large expanses where man has interfered with it less. On the present evidence it seems the course of wisdom at least to suspend judgment upon the status of these races of Curlew.

Notes on some Specimens in the Ornithological Collection of the California Academy of Sciences. By Joseph Mailliard, pp. 28-32.

Consisting of notes and descriptions of specimens of nineteen species. The most interesting of these, in the light of the questioned specific identity of the Little Brown Crane, are series of measurements of ten Little Brown and eight Sandhill Cranes. There is no overlapping amongst them shown.

In From Field and Study:—

Distribution of Townsend Fox Sparrow. By George Willett, pp. 36-37.

Re Swarth's Revision of the Fox Sparrows reviewed in these pages previously, Mr. Willett states that *Passerella iliaca townsendi* commonly winters as well as breeds at the southern end of the Alexander Archipelago, a fact that should somewhat modify some of Mr. Swarth's conclusions expressed in the above work.

No. 2, MARCH—APRIL.

The Priblof Sandpiper. By G. Dallas Hanna, pp. 50-57.

An account of the habits and nesting of this rare bird. One plate showing the eggs.

The Sitkan Race of the Dusky Grouse. By H. S. Swarth., pp. 59-60.

Describing a new sub-species, *Dendragopus obscurus sitkensis*. It has been suspected for some time that the Blue Grouse of the northern coast was distinct from *fuliginosus* but lack of material has hitherto deterred designation. The principal character is an increased redness of color. The specimens cited come mostly from the islands of the Alaska pan-handle from Sitka to Wrangell Island. Probably the race extends south to the Queen Charlotte Islands, specimens from which have long attracted attention to this same character.

In From Field and Study:—

A Record for the Emperor Goose in Oregon. By Alex. Walker, p. 65.

Announces the taking of a specimen on the ocean beach at Hetarts, Tillamook County, Oregon, Dec. 31, 1920. This suggests that straggiers may be still looked for along the British Columbia Coast.

An Afternoon with Holboell Grebe. By A. D. Henderson, pp. 68-69.

Describes the bird diving with young on its back at Silvermore Lake, Alta.

No. 3, MAY—JUNE.

The Probable Status of the Pacific Coast Skuas. By A. C. Bent, pp. 78-80.

The great difficulty of obtaining specimens of pelagic birds and the fact that most of them breed on lonely oceanic islands in the southern hemisphere very difficult of access, has prevented our knowledge of them keeping pace with that of more easily studied species. With new light thrown on these birds through the recent work of Beck and others, Mr. Bent has re-examined some of the western material and announces that California specimens in the California Academy of Sciences can be referred to the Chilean Skua, *Catharacta chilensis*, thus adding a new species to the North American List. By inference he refers *Megalestris skua*, reported in the *Condor*, 1918, taken at sea near the boundary between British Columbia and Washington waters, as the same. This will cause a change in our West Coast list, the elimination of the Skua and the addition of the Chilean Skua.

New Bird Records for North America, with Notes on the Priblof Island List. By Joseph Mailliard and G. Dallas Hanna., pp. 93-95.

This gives notes on the occurrence of seven species in these far-flung islands and adds two to the North American List.

In From Field and Study:—

Notes on the Hypothetical List of California Birds. By J. H. Fleming, pp. 95-96.

Mr. Fleming discusses the cases of three species hypothetically included in the California list on the basis of specimens in the British Museum. The species in question are Woodcock, Hudsonian Godwit and Arizona Cardinal. Having had opportunity to examine these specimens, November, 1920, he decides they will have to be disregarded through insufficient evidence as to the place of their origin.

No. 4, JULY—AUGUST.

Genera and Species. By Richard McGregor, pp. 127-129.

This is a restrained and moderate but very cogent protest against the immoderate subdivision of the generic conception, seconding Dr. Witmer Stone's plea, *Science*, Vol. 51, 1920, p. 427, for

the use of subgenera (not used in specific nomination) for the finer divisions that it may seem expedient to recognize.

In From Field and Study:—

A Murre Tragedy. By R. H. Palmer, p. 135.

Calls attention to the danger to sea bird life of the increasing amount of oil spread over the sea surface by tankers and oil-burning ships. The harm seems to be done by ships ballasting their empty tanks with sea water. When this is pumped out before coming into harbor, much waste oil is evacuated with it. This spreads over the sea, where it penetrates the plumage of swimming birds, mats the feathers together, allows the water to reach the skin and causes their slow death. Measures of regulating this practice are now being considered. Fortunately the waste of valuable oil is an additional reason for care in this direction and shipping companies are not showing themselves antagonistic to the humanitarian efforts of the authorities.

No. 5, SEPTEMBER—OCTOBER.

A Twelvemonth with the Shorebirds. By Allan Brooks, pp. 151-156.

This is a history of the author's experience with shorebirds from early January, 1920, at Comox, Vancouver Island; after April 15th near Massett, Queen Charlotte Islands; a short time in the fall in Alberta and the winter at Jupiter, Florida. It contains a very great deal of interest relating to the migrations and habits of the waders.

Bird Notes from Southeastern Alaska. By G. Willett, pp. 156-159.

Annotations on thirty-six species, mostly from the vicinity of Wrangell. It contains much interesting material, conspicuous amongst which is The Coast Pygmy Owl, *Glaucidium gnoma grinnelli*, that seems not uncommon as far north as Wrangell.

The Northward Range of the Allan Hummingbird. By Tracy L. Storer, pp. 160-162.

As the difference between Allan's and the common Rufus Hummingbird is only positively expressed by the shape and color of one tail feather, considerable mis-identification regarding the former has found its way into print. Mr. Storer has examined available material and decides that Allan's Hummingbird has never been noted in British Columbia or Oregon and he can substantiate but two from Washington. The reviewer has known for some time that the British Columbia specimen cited in the Catalogue of Canadian Birds was actually the Rufus. The bird should be dropped from the Canadian list.

Under Editorial Notes and News:—

The report of the Provincial Museum, Victoria, British Columbia, for the year 1920, by F. Kermode, is noted. Prominence is given to the statement therein that the introduced Chinese Starling, *Acridotheres* (or *Aethiospar*) *cristatellus*, has become well established in the city of Vancouver, and that not less than 1,200 birds roost on the ledges of the buildings. As though the House Sparrow was not a sufficient lesson in the introduction of species we have permitted another undesirable to complicate still further the difficult problems of our civilization. Without doubt organized systematic effort would eradicate this bird now. In a few years' time, as with the Sparrows, millions may be eventually spent without effect.

No. 6, NOVEMBER—DECEMBER.

The Mind of the Flock. By R. C. Miller, pp. 183-186.

Discussing how whole flocks of birds respond to stimuli as though of a single mind. This can be seen especially in the wheelings and circlings of groups of flying waders and is an intensely interesting subject.

In From Field and Study:—

Eclipse Plumage of the Cinnamon Teal. By Frank Stephens, p. 194.

Describes the hitherto unrecorded eclipse plumage of this bird. The "Eclipse plumage" is peculiar to ducks and is an interpolated plumage between the nuptial or spring and the fall plumage acquired by the male during the season of wing moult. It usually resembles that of the female. During it, birds hide very closely and are very difficult to secure. Eclipse plumages of any of the ducks are comparatively rare in collections.

In an Editorial, p. 197.

The Editor discusses the use and abuse of the field-glass as an ornithological study adjunct. Some of his criticisms of the instrument are well founded. The writer knows that for many years he marked and identified birds in the field with, to him, satisfactory certainty, with nothing but the naked eye. Nowadays he feels that it it hardly worth while looking at a live bird without ocular assistance. Undoubtedly we are apt to lean too heavily upon such aids and neglect our natural powers of observation.

Notice is given of the work during the past summer of Mr. C. DeBlois Green on Porcher Island near Prince Rupert, B.C., It is said that he has learned hitherto unknown facts regarding the breeding of the Marbled Murrelet, a bird common enough in breeding condition along our entire west coast throughout the summer but whose nest has not yet been positively identified.

P. A. T.

TERRITORY IN BIRD LIFE.

By H. Eliot Howard

With illustrations by G. E. Lodge and H. Gronvold, London, John Murray, 1920, 8vo., pp. 308, pl. 11, plans 2.

A most interesting book and one that it will repay any student of avian behavior to read. It crystallizes thoughts that have been latent in many of us. We have been so accustomed to the idea that male birds fight each other for the favor of the female that we have scarcely thought to question it. When, however, Mr. Howard advances another explanation we realize that he is but stating that of which we have long been subconsciously aware. He advances that, when birds fight in the spring time, it is not directly for mates that they contend, but to possess or defend territory in which to rear their families, assume definite proprietory rights and tolerate no competitors. This explains much that was unsatisfactory under the older conventional concept; for males fight females as well as males; females engage others of their own sex and both combine against rival pairs or either individual. The fighting also rarely passes certain geographic boundaries, beyond which differences seem to be forgotten, and on neutral territory birds mix indiscriminately without animosity. These well-known facts do not harmonize with exhibitions of sexual jealousy, but are perfectly reconcilable with a competition for territory. An outline of the theory is as follows:

It is the general rule amongst most of our song birds for the male in spring to return to the nesting ground some little time ahead of the female. His first business is to prospect for and establish ownership in the territory he and his mate are to occupy through the coming season. This territory must contain satisfactory nesting sites and promise of food supplies in sufficient quantity so that the young need never be left unprotected from the elements for longer than their tender constitutions can endure under the conditions normally prevailing during the season of their helplessness. Once possession is established he occupies a prominent observation point within his territory and pours forth his song, by which he warns off trespassers and advertises, to such females as may hear, a vigorous male in breeding condition with property qualifications that will refuse no reasonable offer of matrimony. The female therefore comes to the male's call instead of being wooed through it. This is a reversal of our familiar concepts of the working of sexual selection, but does not deny them in any essential. The most vigorous male, with the clearest and most incessant song, will be most likely to hold his territory against competitors, or to attract a female. A premium is thus placed on virility in the one case as in the other. When he is joined by a mate, they unite in defence of their territory. Intruders that may seek to establish themselves in too close proximity are immediately attacked and, if possible, driven off. In this, no respect is shown to sex by either bird. A female is as certain to be attacked by either or both of the pair as is a male. Trespassers are, however, usually driven only to the boundaries of the preserve and victories are rarely followed up when this object is achieved. However pugnacious birds may be in their own bailiwick, those of either opposite or the same sex will meet freely on common feeding grounds without evidence of animosity. Non-competitive neighbors are tolerated much closer than are those of similar species. In these struggles the established bird or birds have the advantage. They are fighting with the vigor of determination for home and fireside, while intruders are less determined and, unless desirable localities are at a great premum, will retreat to seek quarters than can be more cheaply acquired. We often see one bird chase another ignominiously away and into its own proper territory, when the tables are reversed, the aggressor becomes the defendant and retires with equal haste before the assault of the late fugitive.

Most of this reads very convincingly in connection with many of our small song birds and we can see the details of it any day in spring or early summer, but the experienced observer will realize what the author does not suggest, that there are species whose modes of life do not fit into the scheme. Species that mate for life do not have to advertise annually for a mate; those that pair before arrival on the nesting ground have other methods of attracting mates. Praecoces, whose young run at birth and can be taken to the food supplies, are relatively independent of the immediate surroundings of the nest, and polygamist species are fundamentally different from the monogamists in all their family relations. The exceptions in these species, however, cannot be regarded as objections to the application of the rule to others. In fact, in studying the reaction of such a law to varying conditions, a more intelligent understanding of its workings can be obtained. Such exceptions, by interpreting it, may be said to prove the rule.

In connection with this book, it is well to read Mr. Mousley's *Singing Tree** which confirms, in

**Auk*, XXXVI, 1919, 339–348.

fact anticipates much that is here presented. Also Mr. Baldwin's† discoveries of the marital relations of House Wrens in the same and succeeding seasons contains much corroborative material. It is rather surprising that so careful an investigator as Mr. Howard has overlooked these important papers bearing, as they do, intimately on his subject.

A criticism that may not be out of the way is that in spite of the exclusion of this important evidence, the book is padded. Probably the author could have developed his thesis with no loss of weight and with an increase of clarity in half the number of pages. He goes to great length to prove that which can be conceded. The illustrations are photogravures beautifully drawn and reproduced, a credit to both artist and publisher, but they do not bear on the subject in hand. They are portraits of birds in various fighting attitudes that add nothing to the argument and do not illuminate a pertinent idea. As proof that birds fight they are not needed, as illustrations of methods of fighting they do not come within the scope of the work. The plans, however, showing how a field was divided up into spheres of influence in succeeding years by its Lapwing inhabitants, are complementary and valuable additions to the text.

The reviewer is here moved to make formal protest against the all too common practice of the publication of too expensive books on scientific subjects. Knowledge should be made as nearly free to all as possible and books, whose reason for being is the diffusion of knowledge, should be kept within the reach of as many students as is compatible with the end in view. Editions *de luxe*, unless accompanied by a popular edition, are decidedly out of place in scientific fields and should be frowned upon instead of praised and imitated. Good paper, clear type and adequate illustration should be used, of course, but elaborate bindings, deckle-edges, wide margins, large pages within each of which a small island of print floats in a sea of white paper, unnecessarily expensive illustrations and intentionally (I was about to say maliciously) limited editions are to the detriment rather than to the advancement of science and should not be condoned even if they do tend to the personal glory of authors by the high prices attached to the works in second hand catalogues.

Not all of these strictures apply to the work in question, but enough of them do to make a peg on which to hang the complaint. The very fact that the book costs nearly four dollars and a half, Canadian money, sufficiently shows that it is unnecessarily expensive and debarred in consequence from many private libraries that need it. At a time like this when we have often to forego necessary illustrations or make shift with inadequate ones, we question the good taste that uses them to give fictitious value to works that are complete without them.

P. A. T.

†*Abst. Proc. Linn. Soc. of N.Y.*, No. 13, 1918-1919.

GEOLOGICAL SURVEY OF CANADA, MUSEUM BULLETIN NO. 33, 109 PP., 12 PLS., OCTOBER, 1921.

Naturalists whose interests are not limited to the natural history of present day geography will doubtless welcome the group of five palaeontological papers recently published by the Geological Survey as Museum Bulletin No. 33. Biology has its roots so deeply buried in the geologic past that it appears safe to assume that many readers of this magazine will be interested in one or more of the group of five papers published in this Bulletin. The authors include two members of the palaeontological division of the Canadian Geological Survey and three well-known palaeontologists of the United States. The subjects dealt with relate to parts of Canada as far apart as Anticosti Island and the plains of Alberta. The fossils discussed and illustrated represent the Pleistocene, Cretaceous, Devonian, Silurian and Ordovician rocks of Canada and the Cretaceous of Texas.

The papers in the Bulletin are published under the following titles:

Faunal and Sediment Variation in the Anticosti Sequence. By W. H. Twenhofel.

New Species of Devonian Crinoidea from Northern Canada. By Frank Springer.

The Range of certain Lower Ordovician Faunas of the Ottawa Valley, with Descriptions of some new Species. By Alice E. Wilson.

The Fossil Molluscan Faunas of the Marl Deposits of the Ottawa District. By E. J. Whittaker.

Two New North American Cycadeoids. By G. R. Wieland.

Professor Twenhofel sets forth in his paper some very important conclusions from his detailed study of the Anticosti Island Silurian and Ordovician faunas, which should be of interest to all geologists dealing with problems of Palaeozoic correlation. Twenhofel states that "lateral gradation of sediments and faunas may so develop that one type of sediment with its fauna may overlap another—the conditions responsible for one type of deposition migrating laterally with respect to the other. The common interpretation would be "overlap" of the one by the other, a withdrawal of the sea, a land interval, and the development of an unconformity." Twenhofel

does not accept this current interpretation of the lateral changes in the fossil faunas and sediments of Anticosti Island, but states it to be "the purpose of this article to describe examples of sediment and faunal variation in the shallow Ordovician and Silurian seas in which were deposited the sediments which now constitute the rocks of the Anticosti sequence, and to show that in these waters conditions in respect to the processes and results of sedimentation were little different from what they are in seas of the present day."

Mr. Springer's paper describes and figures two new crinoids belonging to the genus Melocrimes, from the Mackenzie basin.

The paper by Miss Wilson materially increases our knowledge of the geological range of the several species comprising the Black River and Trenton faunas in the Ottawa Valley, and adds some new species to these faunas. The author has shown all that her investigations have disclosed regarding range of species by means of a series of tables. These indicate at just what point in the section each species makes its first appearance, and just where it disappears from the section. This paper is a good example of the sort of precise work in collecting and studying fossil faunas which is needed to make stratigraphic palaeontology the exact science which it will some day become.

Mr. Whittaker's contribution deals with a fossil fresh-water fauna found in the marls of the Ottawa Valley which, in its time relations, lies between the latest marine Pleistocene interval and the time represented by the living molluscan fauna. Students wishing to study the fresh-water fossils of the Ottawa Valley Pleistocene will find the plates and keys of this paper most useful. The illustrations of the paper include an aeroplane photograph showing the relation of the fossil marl deposits to the present water level at McKay Lake. So far as the writer is aware, this is the first aeroplane photograph to be used in illustrating a palaeontological paper.

In the paper on fossil cycads, Dr. Wieland has described the first cycad ever recorded from Canadian rocks. The cycads represent a singular and exceptional type of plant which, in the modern world, is confined to the warmer climates. Their short thick trunks have sometimes been called "fossil birds' nests" by quarrymen.

The Canadian specimen of Cycadeoidea described by Dr. Wieland appears to be the latest recorded from North America. "In a few words, the known petrified cycadeoids come in with a certain abundance, quickly culminate in variety and number, and then, after long continental distribution, these uniquely specialized forms slowly disappear toward Tertiary time, to recur no more. With them, too, go the Araucarias, save that these still persist in South America."

Unfortunately, the plates for this bulletin have suffered greatly at the hands of the printers. The palæontologists who prepared the excellent plates for these papers will need more than "a drop of patience" if they can forgive the damage done to them by printing the explanations on the backs of the plates. Discarding the nearly universal practice of printing plate explanations on sheets separate from the plates, which in this case are printed on very thin paper, illustrates a variety of economy akin to that which would be displayed by mounting a fine diamond on a brass ring.

E. M. K.

NOTES AND OBSERVATIONS

A BARKING FROG

Everyone who has studied animals at all closely knows that there is a considerable difference in temperament between individuals of the same species, and that because one individual behaves in a certain manner under certain circumstances it is not necessarily true that all individuals will behave in a similar manner.

This individuality of temperament was brought out very clearly in an experience I had last August with a specimen of the Green Frog, *Rana clamitans*, at St. Andrews, New Brunswick. In a very small pool in a little stream on the Golf Links were two of these frogs. They were floating at the surface of the water against the bank, and while one swam away as I approached the other remained stationary. Seeing that it was not timid I took the opportunity of photographing it, and having done so I reached over and gently stroked its back. I expected it to dart away instantly, but instead of doing so it emitted a sound which can most adequately be described as a bark, and turning about, it snapped at my finger. I tried the same thing again and again with the same result, except that its "barks" became a little louder and its snaps more vicious. The barking sound which it made was utterly unlike anything I have ever heard this species, or any other frog, utter, and if one had not seen the animal which was uttering it he would have had great difficulty in guessing the species of animal from which the note emanated.

A. BROOKER KLUGH.

WHITE GYRFALCON IN ALBERTA:—A fine specimen of the White Gyrfalcon was shot by Mr. Waghorn on his farm at Blackfalds, Alberta, in the act of attacking one of his turkeys in December, 1920. It had been noticed for a fortnight previous to being shot. I saw this rare falcon in Mr. J. H. Grant's taxidermist store in Red Deer in the spring of 1921, and am indebted to him for the above data. The bird is now in the possession of Mr. Waghorn. I believe this is a record for Alberta.

ELSIE CASSELS.

REMARKS ON THE POISON IVY.

When reading Dr. H. T. Gussow's interesting and instructive article on "The Treatment of Skin Irritations due to Poison Ivy"*, I was struck by his remark that "Nobody, of course, ever comes knowingly into contact with poison ivy", because it is not in agreement with my personal experience. I have never avoided poison ivy, have often come knowingly into contact with it, and have never been poisoned by it. Most of my boyhood was spent on Long Island, in the State of New York, where the poison ivy often grows as a large creeping plant, climbing to the tops of trees of moderate size, and where persons are frequently poisoned by it. I distinctly remember that, on one occasion, my brother and I cut a branchless "rope" of poison ivy stem, about an inch in diameter, and perhaps ten or twelve feet long, which we at once used in a "tug-of-war", thus smearing our hands freely with the sap which exuded from the freshly cut ends of the piece of stem, but that neither of us suffered any ill effects as a result. I was not in the range of the poison ivy during the unusually hot weather of the summer of 1921, and I have, of course, no means of knowing whether or not I shall be immune to poison ivy poisoning all my life. I may add that my mother, although she has often come into contact with poison ivy, has never been poisoned by it, but that my father was readily poisoned by contact with it on Long Island.

Poison ivy is widely distributed in Nova Scotia, although it does not grow to a large size in that area. Most Nova Scotians do not realize that poison ivy grows in their vicinity, because it seldom or never causes poisoning in their province. Although I resided in Nova Scotia for more than seven years, I cannot recall that a case of poison ivy poisoning came to my attention during that time. Whether this is due to the northern climate and the dwarfed growth of poison ivy in Nova Scotia, or to the comparatively isolated position of the fauna of the province, or to some other cause, I do not know.

HARRISON F. LEWIS.

*The Canadian Field-Naturalist, Vol. XXXV., No. 6, pp. 116–118, September, 1921.

FOUNDING OF A NEW CLUB.

On November 22nd, 1921, a number of Toronto naturalists met at the Royal Ontario Museum where they organized the Toronto Naturalists' Club. Their purpose was to found an organization which would bring together the men interested in Natural History, and, in so doing, make co-operation possible along various lines of study. Another important purpose was to create a circle of congenial men with mutual interests so that they might enjoy the pleasures resultant from such an association.

The Club is, so far, unique in that it has no officers, the object being to set aside all formality and to place on each man a share of the responsibility for the Club's activities and success. The meetings are led by members, voluntarily and by rotation. The Museum's collections are being used for study, and the resulting discussions bring out many interesting observations and reviews. (It will be here noted that the Museum is rendering a valuable service as well as giving naturalists an incentive to augment its collections.)

It is necessary to restrict the membership of the Club to a small number because an open organization would necessarily lose the original idea of informality and close acquaintance. The following are the founding members:—

J. L. Baillie
N. K. Biglow
J. R. Dymond
T. B. Kurata
Wm. LaRay
Shelly Logier
Chas. Richards
L. L. Snyder
L. Sternberg
Stuart Thompson
Victor Thomson

The Toronto Naturalists' Club solicits the friendship and acquaintance of naturalists and will be pleased to co-operate with them in any way possible. Address any correspondence to the Toronto Naturalists' Club, The Royal Ontario Museum of Zoology, Toronto, Ont.

L. L. SNYDER.

AN INTERESTING FAMILY OF EIDERS

Some thirty years ago the late Mr. Simon F. Cheney lived on Cheney's Island, a small island of the Grandmanan Group in the Province of New Brunswick. He was a very remarkable

man and his knowledge of the birds of his native province was quite exceptional. He had the distinction of taking the last living Labrador Duck, a female which he shot at Sheep Island in Grandmanan fifty-one years ago. This bird he sent to Geo. A. Boardman, of Calais, Maine, who forwarded it to the Smithsonian Institute, Washington, D.C. Incidentally, Mr. Cheney never received a cent for his prize. Eider Ducks used to nest in numbers then at Grandmanan where only a few scattered pairs today breed and rear their young. Mr. Cheney discovered many nests of these birds and frequently placed the eggs under tame ducks and hens. It is a curious fact that Eider Ducks hatched out under hens became blind when about three weeks old. A film formed over their eyes which gradually destroyed their sight. These blind ducklings would invariably die. If, however, the Eiders were hatched out under tame ducks, they never became victims of this blindness. One spring Mr. Cheney discovered an Eider's nest containing six eggs. These he placed under a tame duck and all the eggs hatched. Now the problem was what to feed the ducklings. Mr. Cheney was, however, equal to the occasion. By mixing cornmeal and water he made a thin gruel and, with the addition of sand fleas the birds learned to eat the meal. In picking out the live fleas they would of course get some of the meal and became accustomed to the taste of it. After a time they learned to like the meal and greedily ate it without the addition of the fleas. When the young ducks grew larger, their owner used to take them to a brook and turn over stones in order that the Eiders could catch the small eels and other tiny fish. These young ducks would waddle and swim along behind their master until their appetites were surfeited. They never went far from their pen near the house alone, and were a source of great delight to the many visitors who came to Cheney's Island, among whom were many noted ornithologists of the day. Each night this interesting family of young Eiders was shut up in its pen. Among the visitors to Grandmanan there came a man and his wife from Calais, Maine. The morning after the departure of these tourists Mr. Cheney missed his pets and nothing was heard of them for a month. One day a friend of Mr. Cheney's had occasion to go to Calais and while there heard of a flock of young "Sea Ducks" a woman had in the town. Upon investigation, he discovered they were the same birds which had been stolen from Mr. Cheney. In the night this friend of Mr. Cheney's opened the pen where the ducks were confined and what was their owner's surprise and delight upon opening his back door the following morning to find the birds huddled together upon the stoop. They waddled about him and flapped their wings and talked to him in their accustomed way, showing every indication of delight at getting back home again. From Cheney's Island to Calais is approximately fifty miles, yet these young ducks came safely back in a very short time after being given their liberty, which is only another instance of how wild birds will yield to kindness and protection.

H. A. P. SMITH,
Digby, N.S.

A CORRECTION.

Under the heading of BIG GAME in my paper on the "Mammals of Islay, Alberta," *Canadian Field-Naturalist*, Vol. XXXV, No. 6, p. 111, there appears a confusion of terms regarding the deer of the west. Since considerable time has elapsed since the writing of this paper, I cannot recall how or why I came to use such terminology. Anyway, I wish to redeem myself. The Mule Deer, Black-tail and Jumping Deer, contrary to the impression conveyed by my writing, are synonymous terms. A few lines farther down the Jumping Deer is more explicitly singled out—an obvious error—for what is meant here is the Northern Virginian Deer or White-tailed Deer. The same is true of the reference to the Jumping Deer at Laurier Lake on page 104. There are but two species of deer in Alberta, the White-tail and the Mule Deer.

T. DEWEY SOPER.

AN AQUATIC HABIT OF THE GREAT BLUE HERON

Mr. Lloyd's account of pigeons alighting in deep water recalls a similar occurrence on the part of the Great Blue Heron, *Ardea herodias*, noted on the Rideau Lakes, Ontario, by myself and D. Blakeley.

We were camping on the shore of Big Island, July 11, 1918. Behind us, in the centre of the island was a large heronry, whilst passing over and continuing across the wide expanse of the lake on their way to feeding grounds was a continuous stream of herons. On several occasions whilst watching the birds departing we saw them drop to the lake level, hesitate a moment and then drop softly into the water. They remained perhaps half a minute there and then, with an easy flap of wings rose and continued their way. The distance was too great to see what they did even with 8X prismatic binoculars. There was a movement of the neck and head that may have

meant picking something from the water, dabbling in it, or drinking.

We thought there might be a shoal out there in mid-lake that we were unaware of and made a point of investigating. We found nothing but deep water anywhere in the vicinity of the occurrence. My mother and sister reported an exactly similar occurrence about a year later on Crow Lake, a small body of water southwest of here, so it is evidently a habit not strictly confined to the birds of this one particular rookery. I do not remember hearing or reading of this trait of the species elsewhere.

P. A. TAVERNER.

A LARGE FLOCK OF EVENING GROSBEAKS AT TORONTO

Early on the morning of March 19th, 1922, L. Sternberg and the writer were tramping through a wooded section northeast of Toronto along a small stream known as Jones' Creek. Many of the expected early spring arrivals were noted as well as resident birds of the season. At least one species observed rewarded us for our early morning activities, namely, a flock of Evening Grosbeaks. We were first attracted to them by their loud chattering and were permitted to watch them for at least ten minutes. Three counts were attempted, after which we were able to place their number at thirty plus, which was a conservative estimate.

When first observed, they were scattered through the trees on the opposite side of the creek. Fortunately, they moved toward us, the entire flock settling on the ice which bordered the creek. They kept up a continuous "peeping" which was the last impression left with us after they rose, as if by a gust of wind, and were lost to view as they circled round a clump of trees.

We noticed an interesting effect of light and shadow as we were watching these birds through our glasses. When the male birds' olive and yellow plumage was under shadow, the color effect was that of rufus, similar to the color on the breast of an American Robin. It is this effect of light that causes the frequent reports of impossible birds to the student.

L. L. SNYDER.
Royal Ontario Museum,
Toronto.

AQUATIC HABITS OF PIGEONS.—Recent notes relating to the aquatic habits of pigeons bring to mind an observation which I made some years ago and which at the time introduced a question if there were any fundametal significance in the fact of a pigeon alighting in the water.

The pigeons on my country place at Stamford, Connecticut, were in the habit of flying down to alight upon a rock projecting above the water in a large stream near my barns. One morning I observed a pigeon which flew to this rock for its morning drink, but finding it already fully occupied by other pigeons, circled about two or three times near the surface and then deliberately alighted in the water. This apparently did not disturb the bird particularly, because it proceeded to drink as it slowly floated down stream and then swam to a shallow sandy bar from which it took flight. The pigeons were an ordinary mixed lot of Blue Rock descendants.

ROBERT T. MORRIS, M.D.

BRONZED GRACKLES AS SCAVENGERS.—Above Mooney's Bay, Rideau River, several Bronzed Grackles were observed coursing back and forth over the surface of the water. At intervals one would drop in gull-fashion and lift some morsel from the water, carrying it to land to devour. Upon closer examination these morsels proved to be dead minnows floating along with the current. June 5, 1918.

C. E. JOHNSON.

FIELD NOTES FROM KAPUKASING, ONTARIO.—While engaged in field-work at Kapuskasing, the first week of July, 1919, I saw a nest built by a pair of Yellow Warblers composed almost exclusively of wads of cotton batting picked up around camp.

A Robin in the same locality posted itself on the rocks below Kapuskasing Falls several evenings and caught winged insects, fly-catcher fashion.

A Red Squirrel with left front foot amputated close to the body was a frequent visitor at camp.

C. E. JOHNSON.

FOOD OF AMBUSH BUGS.—Observed an Ambush Bug (*Phymata wolffi*) seize and kill a Little Wood-satyr (*Neonympha eurytus*) as it lit upon a flowering head of Joe Pye Weed, July 28, 1918. On another occasion, one near this same locality, Dow's Swamp, Ottawa, seized and killed a common Honey-bee upon a head of flowering Golden-rod, August 3, 1920.

C. E. JOHNSON.

BUMBLE-BEES ON BLEEDING HEART.—While admiring the bloom on a plant of Bleeding-heart many of the blossoms were noticed to have been perforated on their upper ends. A few minutes later a Bumble-bee arrived and promptly proceeded to extract nectar through the openings. Several came later and when a blossom was encountered with no mutilation, the bee dexterously lacerated it to obtain the hidden sweets.—Ottawa, May 19, 1918.

C. E. JOHNSON.

The Canadian Field-Naturalist

VOL. XXXVI OTTAWA, ONT., APRIL, 1922. No. 4

BIOLOGICAL NOTES ALONG FOURTEEN HUNDRED MILES OF THE MACKENZIE RIVER SYSTEM.

By M. Y. Williams

THE following observations were made while on an exploration trip in the Mackenzie River valley for the Geological Survey of Canada in the summer of 1921. The writer travelled in company with Dr. G. S. Hume and Mr. E. J. Whittaker, officers of the Geological Survey, as far as Fort Providence, where Mr. Whittaker started exploration. Dr. Hume and the writer kept in touch with each other throughout the summer.

ITINERARY

From Peace River Town on Peace River, down stream to Lake Athabasca outlet, thence down stream via the Slave River to Great Slave Lake, down the lake 125 miles to the head of Mackenzie River, thence downward 550 miles to the site of the oil well 58 miles below Fort Norman which has so recently stirred the public imagination.

We started at Peace River Town on May 19; our farthest north was the Imperial oil well, fifty odd miles below Fort Norman, which we visited on August 13-14. Returning from Norman on August 21, we reached Smith on September 4, and McMurray, via Athabasca River, September 9; the round trip aggregating about 2700 miles.

TOPOGRAPHY AND FLORA.

The country between Peace River Town and Fort Vermillion is high, rolling prairie, more or less covered with poplar and willow. Below, the general characters are best described as muskeg. Sphagnum moss is the common carpet, black spruce the common forest tree. Sand ridges covered with jack pine are sparsely distributed, and stands of black poplar are interspersed between muskeg areas. Alders border the streams, and white birch and white poplar occupy the better land along the rivers. Numerous lakes occur, mostly of shallow character, Such is the country visited, except where the mountains bring relief to the sight as well as to the landscape. From the mouth of the North Nahannie to Fort Wrigley mountains are the controlling landscape feature, and from here down stream they are rarely more than ten miles from the river. The ubiquitous muskeg, however, is indomitable and laps the hillsides, and even the tops of the low ridges, holding perpetual frost little below the moss roots.

The wood flowers, including beautiful Ladies' Slippers and other fine orchids, are common in June, while the thrushes sing, accompanied by White-throats, White-crowns and other wood songsters. July is the time of fireweed—the burns on the uplands and mountain sides are pink with it. August is the time of asters, and, after the middle of the month, of the yellowing poplar, of the reddening leaves of the fireweed and, in general, of the fading leaf.

The following species of plants were collected between Ft. Simpson and Ft. Wrigley in 1921 by the author, and identified by Professor John Davidson, botanist in charge of the Herbarium and Botanical Gardens of the University of British Columbia.

Potentilla fruticosa (Shrubby Cinqfoil.)
Achillea millefolium (Yarrow.)
Gentiana sceptrum (Swamp Gentian.)
Parnassia palustris (Grass of Parnassus.)
Elaeagnus argenteus (Buffalo Berry.)
Campanula rotundifolia (Scottish Blue Bell.)
Hedysarum Mackenzii (Hedysarum.)
Galium boreale (Northern Bedstraw.)
Castilleja, sp? (Indian Paint-brush.)
Pinguicula vulgaris? (Butterwort).
Cypripedium passerinum (Northern Lady's Slipper.)
Cypripedium parviflorum (Small Yellow Lady's Slipper.)
Orchis rotundifolia (Round-leaved orchid.)
Anemone patens wolfgangiana *(Prairie Anemone.)
Asplenium viride. (Spleenwort.)
Campanula Sp?

FAUNA.

According to Preble, the Mackenzie valley, as traversed by the author, falls within the Canadian Life Zone, the Mackenzie and Franklin mountains, however, being within the Hudsonian Zone. As

*This species not previously found east of the Rockies, according to the records in the Geol. Survey Herbarium.

will be seen below, the northern extension of the range of the Meadow Lark suggests affinities with regions hundreds of miles farther south.

NOTES OF OCCURRENCES.

BIRDS.

HOLBOELL GREBE. *Colymbus holboëlli.* One seen on Rocher River, Sept. 6th.

PACIFIC LOON. *Gavia pacifica.* Two positively identified by their grey hoods near mouth of Root River, July 12th, and five at Fort Norman, August 12th. Loons seen on Great Slave Lake, June 7-8th. and near Ft. Wrigley, August 10th, were probably *Gavia imber.*

SLATY-BACKED GULL. *Larus shistisagus.* Several large, dark-backed Gulls seen on Great Slave Lake, June 7th and 8th, resembling the Great Black-backed Gull of the Atlantic coast.

HERRING GULL. *Larus argentatus?* Fairly common on Peace, Slave and Mackenzie Rivers and Willow Lake River (July 1-17). Immature bird seen at Fort Wrigley, July 30th and 31st. Common at Norman. Common at Wrigley Harbour at foot of Great Slave Lake, Aug. 31st and Sept 1st.

RING-BILLED GULL. *Larus delawarensis.* Fairly common on Willow Lake River, July 6-8th. Short-billed gull probably confused with this species.

BONAPARTE GULL. *Larus philadelphia sp?* Common at mouth of Slave River, June 6th. Bill black, no rosy tinge noticed.

COMMON TERN. *Sterna hirundo.* Common on Slave River, June 9th, and at Wrigley Harbour, June 12th. This may be *s. paradisaea.*

BLACK TERN. *Hydrochelidon nigra surinamensis.* Common at mouth of Slave River, June 9th.

WHITE PELICAN. *Pelicanus erythrorhynchus.* Six seen commonly at Smith Rapids, June 1-5.

MERGANSER. *Mergus americanus* or *serrator.* One female seen on Willow Lake River, June 14th. Two at Wrigley Harbour. Aug. 31st and Sept. 1st.

MALLARD. *Anas platyrhynchos.* Common on Peace and Upper Slave Rivers, May 19-30. Female frightened from nest and 12 eggs under spruce tree on dry lands above river about 30 miles above Fitzgerald, May 30th. Several females seen on Willow Lake River, July 1-14. Common on flats of Little Lake below Providence, Aug. 30th. Common Wrigley Harbour, Aug. 31st and Sept. 1st.

BALDPATE. *Mareca americana.* One male taken on Slave River 30 miles above Fitzgerald, May 29th. Common at Wrigley Harbour, Aug. 31st.

GREEN-WINGED TEAL. *Nettion carolinense.* One of the commonest ducks seen throughout trip, wherever narrow channels or small lakes occur. Broods of year fully grown in lakes east of Wrigley, Aug. 1-7. These were living on local berries of muskeg. Common at Wrigley Harbour, Aug. 31st.

SHOVELLER. *Spatula clypeata.* Commonly seen along E.D. & B.C. Ry., near Lesser Slave Lake, and on Peace River above Carcajou, May 17-20. Common at Wrigley Harbour, Aug. 31st.

PINTAIL. *Dafila acuta.* Common on Peace River. Fairly common at Wrigley Harbour, Aug. 31st.

CANVASBACK. *Marila vallisneria.* Several seen in bag of a hunter at Fort Chipewyan, Sept. 7th.

AMERICAN SCAUP DUCK. *Marila marila.* Common on Peace River in small flocks, May 19-28.

BUFFLE-HEAD. *Charitonetta albeola.* Common on Peace River. Female at two islands 30 miles below Simpson, June 20th. Females also seen on Willow Lake River, July 10th and at Old Wrigley, July 23rd.

AMERICAN GOLDEN-EYE. *Clangula clangula americana.* Common on Peace River; male and female taken. Female and fourteen downy young, 35 miles below Fort Simpson, June 28th. Female and eight large downy young east of Wrigley, August 1st, living on young clam shells the size of peas.

WHITE-WINGED SCOTER. *Oidemia deglandi.* Seen on Great Slave Lake, June 8-9th.

SURF SCOTER. *Oidema perspicillata.* Generally common throughout region. Except for the occurrences noted above, no breeding ducks were observed and they do not appear to nest in large numbers along the Mackenzie river where visited.

SNOW GOOSE. *Chen hyperborea.* A flock of 15 seen in Little Lake below Providence, Aug. 30th. These were probably the Lesser Snow Geese. One seen in hands of hunter at Fort Chipewyan, Sept. 7th.

CANADA GOOSE. *Branta canadensis.* Several flocks seen on Peace River. One taken. Reported common on Carcajou River by Mr. Link, and on Trout River above Providence by Mr. Whittaker.

AMERICAN WHITE-FRONTED GOOSE. *Anser albifrons gambeli.* Birds probably of this species, locally called "Brant," common on Slave River and in flocks along length of Mackenzie traversed.

AMERICAN BITTERN. *Botaurus lentiginosus* One heard by party at Wrigley Harbour, foot of Great Slave Lake, June 12th.

CRANE. *Grus canadensis?* One seen in wet muskeg 3 miles back of Two Islands Village, June 18-20 (about 30 miles below Fort Simpson). This was evidently a breeding female as it frequented one locality and made considerable dis-

turbance while running away. The color was warm brown.

SEMIPALMATED SANDPIPER. *Ereunetes pusillus.* Two doubtfully identified east of Wrigley, Aug. 3rd.

GREATER YELLOW-LEGS. *Totanus melanoleucus.* Several near mouth of Nahanni river, June 27th; one on Willow Lake River, July 9th; one near Old Wrigley, July 20th; 6 east of Wrigley, Aug. 6th.

LESSER YELLOW-LEGS. *Totanus flavipes.* Several seen in vicinity of Wrigley appeared to be too small to belong to last species and probably belong to the smaller species.

SOLITARY SANDPIPER. *Helodromus solitarius.* A pair with young seen at Two Island Indian village, June 16-28. One on Willow Lake River, July 7th; common at Norman, Aug. 12-14.

SPOTTED SANDPIPER. *Actitis macularia.* Very common. Nest of 4 eggs on Willow Lake River, July 8th. Young seen on Willow Lake and Mackenzie Rivers north to Wrigley, July 8-18. Common to Norman and Oil Well.

AMERICAN GOLDEN PLOVER. *Charadrius dominicus.* One male seen on top of Bear Rock, Aug. 12th, and approached to within 10 feet.

SEMIPALMATED PLOVER. *Aegialitis semipalmata.* Several seen on Peace River, May 20-30. and on Willow Lake River and at Old Wrigley, July 12-22.

SPRUCE GROUSE. *Canachites canadensis.* Fairly common in spruce of muskeg from Fitzgerald to Norman. Female and downy young, June 21st, on trail 30 miles below Simpson. Female and 12 young near Old Wrigley, July 19th. Common at Wrigley Harbour, Aug. 31st. Some seen may have been *C. franklini.*

RUFFED GROUSE. *Bonasa umbellus.* Three females with young on trail 30 miles below Simpson, June 20-25. Twelve half-grown young near Old Wrigley, July 22nd. Species seen commonly as far north as Wrigley, Aug. 1st. This is probably the Gray Ruffed Grouse.

ROCK PTARMIGAN. *Lagopus rupestris.* One seen on Cap Mountain, 15 miles east of Fort Wrigley, Aug. 5th.

SHARP-TAILED GROUSE. *Pediœcetes phasianellus.* Reported common at rapids 35 miles up Bear River, Aug. 15-24.

MARSH HAWK. *Circus hudsonius.* Seen once or twice on Peace River. One male seen at Wrigley Harbour, June 12th. One female on Willow Lake River, July 13th; one female at Norman, Aug. 13th; one female taken at Norman, Aug. 23rd.

SHARP SHINNED HAWK. *Accipiter velox.* Fairly common at Norman, Aug. 11-25. A female taken at Wrigley Harbour, Aug. 31st, and a male Sept. 1st. They were following rusty blackbirds.

AMERICAN GOSHAWK. *Astur atricapillus.* One immature bird seen in Jack pine forest east of Fort Wrigley, Aug. 3rd.

RED-TAILED HAWK. *Buteo borealis.* Many seen. Immature bird in dark plumage shot near mouth of Slave River, June 8th. This one had lost about ½ inch of hind toe. Common in Jack pine sandy knolls 30 miles below Simpson, June 20-25. Seen commonly on Willow Lake and Mackenzie River north to Wrigley, July 1-30. One seen 30 miles below Wrigley, Aug. 10th. One seen carrying rabbit at Smith Creek, July 26th. This is probably the Western Red-tail.

DUCK HAWK. *Falco peregrinus anatum.* Several pairs seen at gypsum cliffs, Slave River, May 29th. Two nests in recesses in gypsum cliffs about 40 feet above the water, two large young sitting in one nest. Two seen at Rock-by-the-Riverside, Aug. 7-8th; two at Bear Rocks, Fort Norman, Aug. 14-19, on which dates a large female was taken. One seen at Wrigley, Aug. 18th, and one at Providence, Aug. 30th.

PIGEON HAWK. *Falco columbarius.* Doubtfully identified on Willow Lake River, July 13th. A pair seen at Norman, Aug. 12-16. One was seen to catch a cliff swallow on the wing.

SPARROW HAWK. *Falco sparverius.* One seen on Lone Mountain at mouth of Nahanni River, June 28th. One on Willow Lake River, July 2nd. Several at Wrigley, July 30th, and fairly common at Fort Norman, Aug. 12-19.

AMERICAN OSPREY or FISH HAWK. *Pandion haliaetus carolinensis.* Absent on muddy waters. One seen at Simpson, Aug. 29th, and one at Wrigley Harbour, Aug. 31st, and one, Sept. 1st.

GREAT GRAY OWL. *Scotiaptex nebulosa.* One seen in spruce woods 14 miles above Fort Wrigley, July 28th. A female (?) shot at Athabasca Landing by Wm. Fowler, Jan. 1922 and sent to the writer.

AMERICAN HAWK OWL. *Surnia ulula caparoch.* One seen in black spruce in muskeg near Fort Norman, Aug. 13th. One male taken at Wrigley Harbour, Aug. 31st.

BELTED KINGFISHER. *Ceryle alcyon.* Generally distributed. One seen most days but commoner on clear waters, e.g. the Willow Lake River. Seen at Fort Norman, Aug. 12-14, and at Simpson, Aug. 29th.

HAIRY WOODPECKER. *Dryobates villosus.* Heard on Willow Lake River, July 10th. Common in vicinity of Fort Wrigley, July 22—Aug. 7. This is doubtless the Northern Hairy.

YELLOW-BELLIED SAPSUCKER. *Sphyrapicus varius.* Common along Peace River, May 20-30.

FLICKER. *Colaptes auratus.* Seen commonly on Peace River, June 19-29th, and fairly common-

ly along Mackenzie River as far north as Fort Wrigley, one or more being seen or heard every day, July 4—Aug. 7th. One seen at Wrigley Harbour, Sept. 1st. This is probably the Northern Flicker.

NIGHT HAWK. *Chordeiles virginianus.* Common. Three nests and eggs seen on Jack pine sand knolls 30 miles below Fort Simpson, June 18-27. Common in evenings north to Fort Wrigley in July and till Aug. 9th, when we went down river.

PHOEBE. *Sayornis phoebe.* Common at posts and Indian settlements along Peace, Slave and Mackenzie rivers north to Fort Wrigley. A pair nesting at Two Island Indian village, 30 miles below Fort Simpson, June 17-27. Heard at mouth of Willow Lake River, July 1-2, and 12-16. Nest and five young seen at Old Wrigley, July 22nd.

OLIVE-SIDED FLYCATCHER. *Nuttalornis borealis.* Notes heard commonly along Peace, Slave and Mackenzie rivers during June and on Willow Lake River, until July 13th. One taken at Bear Rock, Fort Norman, Aug. 23rd.

LEAST FLYCATCHER. *Empidonax minimus.* Heard commonly along Mackenzie River, June 21-30, and also on Willow Lake River, July 12th.

CANADA JAY. *Perisoreus canadensis.* Fairly common along whole route. Seen or heard practically every day on Willow Lake and Mackenzie Rivers north to Wrigley, during July and Aug. 1-7. One seen at Norman, Aug. 13th, one at Fort Simpson, Aug. 29th, common at Wrigley Harbour, Aug. 30-31.

NORTHERN RAVEN. *Corvus corax principalis.* A few seen along Peace River, May 19-29. Common at mouth of Willow Lake River, at Wrigley, Norman, Simpson and Providence or near posts, river mouths and where mountains flank rivers.

RED-WINGED BLACKBIRD. *Agelaius phoeniceus.* Common on sloughs near Carcajou, Peace River, May 21st. This is doubtless the Northern Redwing.

WESTERN MEADOWLARK. *Sturnella neglecta.* One bird seen at Two Island Indian village 30 miles below Simpson, June 17th. Reported taken at Simpson by Capt. Mills.

RUSTY BLAKCBIRD. *Euphagus carolinus sp?* Seen at Two Island Village, June 25th. Two seen at Willow Lake River, July 17th. Flock seen at Providence, Aug. 29th, and several flocks seen at Wrigley Harbour, Aug. 31st.

WHITE-WINGED CROSSBILL. *Loxia leucoptera.* Common near Two Islands, June 20th. Heard and seen every day between Willow Lake River and Wrigley, July 2—Aug. 10; at Simpson, Aug. 29th, and Wrigley Harbour, Aug. 30-31.

SNOWFLAKE. *Plectrophenax nivalis.* A flock seen at Fort Norman, Aug. 19th.

ENGLISH SPARROW. *Passer domesticus.* One female seen commonly at Two Islands Indian village, where it entered a cabin occupied by us, June 26-27.

WESTERN SAVANNAH SPARROW. *Passerculus sandwichensis.* Small dark sparrows probably of this species are common along Mackenzie River, but are so retiring that they were not satisfactorily identified.

WHITE-CROWNED SPARROW. *Zonotrichia leucophrys?* Common, in full song, and nesting at Two Islands, June 17-28th. In song on Willow Lake River, July 12-14. This may be *Z. leucophrys gambeli.*

WHITE-THROATED SPARROW. *Zonotrichia albicollis.* Common everywhere. In song until July 18th (near Old Wrigley). Seen at Wrigley Harbour, Aug. 31st.

CHIPPING SPARROW. *Spizella passerina.* Common at Two Islands and on Willow Lake River, June 17-July 14. This is doubtless the Western Chipping Sparrow.

SLATE-COLORED JUNCO. *Junco hyemalis.* Nesting along Slave River, May 30th. Common everywhere.

ROSE-BREASTED GROSBEAK. *Zamelodia ludoviciana.* Common at Peace River Town and at Fitzgerald (May 2nd and 3rd.)

CLIFF SWALLOW. *Petrochelidon lunifrons* Hundreds of nests on face of rock cliffs, Peace River, and birds present May 20—23. One bird seen at Wrigley, Aug. 10th, one at Norman Aug. 13th.

TREE SWALLOW. *Iridoprocne bicolor.* Several seen on Willow Lake River, July 5th.

BANK SWALLOW. *Riparia riparia.* Hundreds of holes in sand banks of Willow Lake River, the river between the Two Mountains and in the Tertiary soft sandstone beds in the vicinity of Norman. Birds seen at nests on Willow Lake River, July 2nd and 15th, and several seen at Wrigley, August 10th.

RED-EYED VIREO. *Vireosylva olivacea.* Probably common, but never satisfactorily identified. A bird with yellow belly seen at Wrigley Harbour, Aug. 31st, might be the Philadelphia Vireo, *Vireo philadelphicus.*

YELLOW WARBLER. *Dendroica aestiva.* Common at Peace River Town, May 18th and 19th. One seen at Willow Lake River, July 16th. One at Wrigley, Aug. 8th.

MAGNOLIA WARBLER. *Dendroica magnolia.* One seen at sand hills back of Two Islands, June 25th.

WATER-THRUSH. *Seiurus noveboracensis* Common in swamp at Fitzgerald, June 1st to 5th. One on Willow river, July 9th. This is probably the Grinnell Water-thrush.

AMERICAN PIPIT. *Anthus rubescens.* Three seen on Cap Mountain, Aug. 5th, two at Norman, Aug. 14th, several, 15-20. One at Wrigley Harbour, Aug. 31st.

HUDSONIAN CHICKADEE. *Penthestes hudsonicus.* Common back of Two Islands, June 16-28; on Willow Lake River and along Mackenzie River as far north as Wrigley, July 8-Aug. 7.

RUBY-CROWNED KINGLET. *Regulus calendula.* Two seen back of Two Islands, June 2nd.

HERMIT THRUSH. *Hylocichla guttata pallasii.* Characteristic song heard during days and more rarely during evenings along Peace, Slave and Mackenzie Rivers, May 20-July 8. (July 1-8 along Willow Lake River). This is probably the Eastern Hermit thrush.

GRAY-CHEEKED THRUSH. *Hylocichla aliciae.* Notes made by this or the Olive-backed Thrush heard every evening along Peace, Slave and Mackenzie Rivers from May 20-July 18, when two were seen near site of Old Fort Wrigley.

AMERICAN ROBIN. *Planesticus migratorius.* Occasionally seen on Willow Lake River and along Mackenzie River from the Willow to Fort Norman, where it was common Aug. 18th. Heard at Simpson, Aug. 29th.

MOUNTAIN BLUEBIRD. *Sialia currucoides.* An entirely blue bird was seen on the top of the Rocky-by-the-Riverside, Aug. 8th.

MAMMALS.

MOOSE. *Alces americanus.* One yearling seen on Smith Creek* July 26th; numerous tracks in mountains back of Smith Creek. Tracks common in vicinity of Fort Wrigley. Reported common up North Nahanni and Gravel rivers. Indians make boats out of green moose hides on the Liard and Gravel rivers and bring their families and furs out in them. The largest boats require eight skins.

WOOD BISON. *Bison bison athabascae.* Park rangers at Fitzgerald report the buffalo of the Smith reserve to be doing well. An accurate estimate of their number is difficult to make, because of the muskeg and wooded nature of the country. Major McKeand and party reported seeing two bulls in a three-day return trip in July, with pack horses from Fort Smith. The timber wolves are reported to be taking calves.

HUDSON BAY RED SQUIRREL. *Sciurus hudsonicus.* Common throughout the region.

*About 12 miles above the present site of Fort Wrigley.

CHESTNUT-CHEEKED VOLE. *Microtus xanthognathus.* One taken on Willow River, July 23rd.

NORTHWEST MUSKRAT. *Ondatra zibethica spatulata.* Common at mouth of Slave River and one seen at Wrigley Harbour.

CANADIAN BEAVER. *Castor canadensis.* Reported fairly common up North Nahanni River in late June. Several seen near mouth of Root River early in July.

MACFARLANE VARYING HARE. *Lepus americanus macfarlani.* Several seen in snares at Fort Fitzgerald, June 1-5. Fairly common in vicinity of Fort Wrigley (New) and 15 miles above, where one (apparently young) was seen in the talons of a Red-tailed Hawk which circled to a considerable height and then started to soar straight for its destination. Common also at Fort Norman. These hares appear to be on the increase.

CANADA LYNX. *Lynx canadensis.* One seen by Dr. Hume's party up North Nahanni river in June.

CONTINENTAL ARCTIC FOX. *Vulpes lagopus innuitus.* A fair number were brought into Fort Norman from the Gravel River and from Great Bear Lake. One was trapped at Fort Norman last winter.

BLACK BEAR. *Ursus americanus.* One seen by our party 50 miles above Fort Norman, Aug. 10th. One seen at Bear Rock, Aug. 12th. Numerous tracks were seen in Franklin Mountains in July.

POLAR BEAR. *Thalarctos maritimus.* A very large skin was brought to Fort Norman from Great Bear Lake, where it was probably obtained from Coronation Gulf Eskimos.

CANADIAN OTTER. *Lutra canadensis.* One reported by Hume's party on North Nahanni during the latter part of June.

WESTERN MINK. *Lutreola vison energumenos.* Reported as rather rare and difficult to trap. One skeleton among martin skeletons at Two Island Indian village.

ALASKA MARTEN. *Mustela americana actuosa.* A fair number taken to Forts Simpson, Wrigley and Norman by trappers. Judging by reports and the skeletons seen at the Indian villages, this is the most numerous fur-bearer in the district. A glimpse of a marten was had by the author in the bush about 10 miles above Fort Wrigley, July 27th.

FISHES.

WHITEFISH. *Coregonus sp.* These were the commonest fish caught by the Indians in the vicinity of Fort Wrigley.

INCONNU. *Stenodus mackenzii.* Very common, up to three feet in length at Wrigley Harbour, June 12th.

LAKE TROUT. *Cristivomer namaycush.* Two fine specimens nearly 3 feet in length caught by our party at Wrigley Harbour, June 12th.

ARCTIC GRAYLING. *Thymallus singifer.* Two caught at Wrigley Harbour, June 12th. Common in Smith Creek, 12 miles above Fort Wrigley.

PIKE or JACKFISH. *Esox lucius.* Very common and up to 3 feet in length at Wrigley Harbour, June 12th.

MANITOBA GRASSHOPPERS

BY NORMAN CRIDDLE

(*Continued from Vol. XXXVI, No. 3, March, 1922.*)

GRASSHOPPERS, as a whole, form an extremely important class of insects. As farm pests they are probably second to none, while indirectly they are an asset which assists greatly in the perpetuation of wild life. To the farmer, they are frequently very obnoxious, to the sportsman beneficial, to the community at large occupying a position that cannot be definitely classified at the present time. It may be useful or harmful, but much more will have to be known about the economic relation between grasshoppers and other animals before accurate information is available on this last point. No one can say truly that the world would be better without grasshoppers, yet the losses they cause each year aggregate millions of dollars.

Nearly all grasshoppers are vegetable feeders, but it does not follow that they are necessarily injurious on that account. Most of them might become so were they to increase sufficiently, but the majority of them never do, and we can, therefore, restrict the truly destructive species to a comparatively small proportion of the total number existing.

In spite of the devastating habits of certain species, grasshoppers, as a whole, play an important part in the scheme of nature; but for them a number of creatures could not exist at all, while many others would be much reduced in numbers. In the insect world there are certain Diptera, Hymenoptera and Coleoptera that live entirely at the grasshopper's expense. These are of a parasitical or predaceous nature. Some of this class devour the eggs, others live within the adult bodies. The egg destroyers are extremely important in reducing locust outbreaks and during the last three years they have done more than any other grasshopper predator to bring the outbreak within bounds. A certain Bee-fly (*Systaechus vulgans*) has been of much value in this respect. The adult is a very hairy yellow fly generally found resting upon flowers, the larva, a much wrinkled inactive grub, met with among the grasshopper's eggs. Of the Coleoptera, Blister Beetles play an important part in destroying grasshopper eggs. There are various species of this beetle which in the adult stage devour vegetable matter. One (*Macrobasis murina*) is an important pest of potatoes in Western Canada, and here again there is difference of opinion as to whether a species does more harm than good. It cannot, however, exist without grasshopper eggs and for that reason it only becomes a pest during serious grasshopper outbreaks. Another beetle larva (*Percosia obesa*) runs actively about the surface of the ground in search of food and is an expert at locating locust eggs. Having discovered a sac of these it proceeds to make itself at home until it has eaten them. We found a number of these larvae with eggs in their jaws during 1921 and so intent were they upon the feast that they continued to enjoy it even when placed in confinement.

Certain Flesh flies (*Sarcophagidae*) are also valuable grasshopper exterminators. These flies usually attack the adult grasshopper and deposit their maggots while their host is on the wing. Of the wasp-like flies (*Hymenoptera*) a number could be mentioned as grasshopper hunters. Some of these make individual grasshopper eggs their home in which they develop through all their stages. Others carry off their victims bodily and store them in burrows as food for their young. These insect enemies are extremely useful in man's welfare and without their aid grasshoppers would increase beyond all bounds.

Perhaps the greatest benefiters from grasshoppers are birds and I believe it would be easier to enumerate the species that do not eat these insects than to list the ones that do.

In the Middle West, Grouse, such as the Sharp-tail, multiply or decrease in accordance with the number of grasshoppers present, because the rearing of young depends largely upon the available supply of hoppers. The Western Meadow Lark is another bird whose numbers are maintain-

than a 'voice', apparently intended to intimidate her mate. This behaviour elicited an occasional response from the male, who squealed back, however, with a much greater show of composure. I was now within 40 feet of the Owls, but I might have been 40 miles distant for all the notice they took of me. Whatever concern they lacked, however, was amply compensated for by my excitement, for by this time I had guessed who were my newly-found friends.

The next Owl move was made by the 'missus' who took a noiseless dip to the side of her husband on the stump, this being the occasion for further monkey-chattering from both birds. I was getting my camera into play when the male took a fresh grip of the expiring young grackle and flew off through the woods, hoping, presumably, to get rid of wifey. She followed close on his trail, however, both birds squealing back and forth as they flew, while I followed hastily, hoping to locate their nesting site. They did not go far and I soon came up to them again; the male was perched on a high branch of a large birch, the female below him on the same tree. When their chattering had died down the male busied himself with his victim and proceeded leisurely to divest it of its feathers (the meat was evidently being prepared for the baby owls when hatched). I watched this performance through my binoculars for two or three minutes, during which time the female disappeared from the scene, her departure being absolutely noiseless.

As the male Owl was making such a slow job of it I started to canvass the woods with Old Man Lussier in the hopes of locating the female on her nest in the broken-off top of one of the dead trees. We must have spent nearly three hours canvassing truncated trees without discovering a clue, all the time supposing the female to be incubating her eggs. Here's where luck failed me, however, and my cup of joy remained only half-filled, for the nest was never found.

The sun was sinking low when Old Man Lussier and I arrived back at the spot where we had left the canoe. Taking a last look backwards—loathe to leave my new feathered friends even for the night—my eye caught a 12 foot stump in the middle of a small shallow slough. Perched on the top, silently and patiently watching for his prey, was the male Hawk Owl. I pointed him out to Lussier, who remarked in his broken English, "she's get late," thinking no doubt of something more palatable than Owls (we had eaten nothing since breakfast.) I had with me on this trip a small Premo Camera with a film-pack, expecting to obtain nest-and-eggs pictures only; what was now required was a reflecting camera. I decided to try a picture, however, if I could get close enough, even if I had to tilt the camera considerably. I guessed my first picture at 35 feet; then took a few steps in the water and snapped No. 2 at 25 feet; I became quite excited stalking my game and discovered the camera (?) was shaking a trifle when I snapped No. 3 at about 15 feet; No. 4 was at about 10 feet and still no move on the part of the sphinx! With his yellow eyeballs gazing intently at me I crept a few inches nearer when a whistle from Lussier nearly made me jump; but I refrained from swearing aloud as I was too close to a feathered gentleman in whom I was greatly interested! The next moment the Owl raised his head and gave vent to a few of his peculiar screeches. Was this intended to summon his mate, or what? I looked around to see what Lussier's whistle had meant. He was holding up a field-mouse in his hand and while I watched he knocked over a stump and stamped on some more (nearly every stump in these woods harbored a nest of these rodents). Then I took two or three final steps and came right up to the stump. The owl still intermittently uttered his vibrating cries but showed no signs of departing. Between screeches he would look down at me without expression or sign of fear and I took a picture of him in this pose. For my last attempt I moved around for a side picture to take in the 'hawk' tail. Alas, all these photographs were poorly-timed and distorted! Another whistle from Old Man Lussier and I saw him hold up a field-mouse stuck in the end of a stick which he had cut. This time I understood what he wanted and I told the Owl if he would wait I would get him what he had been hunting for! I splashed over to Lussier and brought back stick and mouse to 'Monsieur Hibou," as Lussier called him, who resumed his programme of squeals even more persistently than before.

It was here that I took special note of the Hawk Owl's notes. With head thrust forward and mouth wide open, displaying a quivering red tongue—altogether a snarling expression—those weird, vibrating and unmusical sounds beat forth. At this distance of only six feet a certain huskiness was perceptible, the vocal chords sounding as if he had 'yelled himself hoarse,' so to speak, but the screeches were not as strong or penetrating as was suggested by the energy displayed in producing them. The birds nearly always cried as they flew through the woods and at a distance their cries have a somewhat uncanny sound. During all my observations I detected little variation in their cries. They apparently have no other call-notes and no 'hoot.'

Having made these mental notes I tentatively held up stick and mouse to the Owl, at which he stopped squealing and cocked his head from one

brethren below. Such is *Empusa grilli*. A third may fall a prey to a wasp. A fourth is parasitized, while others fall victims to birds. Thus it is that the original numbers diminish by more than half, yet a single survival producing eggs may double the previous year's output. In other words for every 50 eggs laid some 48 must be accounted for by death before they mature into adults in order to maintain a balance. A tremendous task for nature to provide for. On the other hand, should this balance fall below the figures indicated then there will be a rapid decline in the grasshopper birth rate and a corresponding reduction in such of their enemies as depend upon them for food. How involved their economic relations are! How unfit are we, with our present knowledge, to judge which one should live or die even to provide for our own benefits!

It may be that in the dim future cultivation will have become intensified and every acre of land be so fully utilized that the old grasshoppers of the plains will have ceased to exist. If that is so then many a bird now prevalent will be rare or extinct. The prospect is not a happy one, and so, in spite of the enormous ravages inflicted, we are inclined to say "long life to the grasshopper."

THE AMERICAN HAWK OWL (*Surnis ulula caparoch*)

BY F. NAPIER SMITH

SATURDAY afternoon, the 22nd May, 1915, I left Montreal for Lochaber, P.Q., to visit the Campbell's Bay Club, a private game club situated on the north shore of the Ottawa River, in Latitude 45° 35′, Longitude 75° 18′, about 25 miles east of Ottawa, Ont.

I had never visited this district and was anxious to observe its avifauna, having been told by members of the Club that it was a veritable bird-paradise. I noted with pleasure that that abomination, the English Sparrow, was conspicuous by its absence, but I regret I did not discover a single specimen of our beautiful Wood Duck which only two years previously was recorded as breeding in the locality. The only ducks I found nesting were the Black and American Golden-eye (Whistler). Altogether, I recorded 77 species, including such interesting birds as the Scarlet Tanager, Rose Breasted Grosbeak, Great Crested Flycatcher, American Woodcock, Wilson's Snipe and a real 'rara avis,' the American Hawk Owl.

On Sunday morning, at 5.30 a.m., "Old Man" Lussier (the Guardian of the Club) and I started off in a canoe to explore the district by land and water. The 'Bay' is virtually a large lagoon, some 2½ miles in length and varying from 200 yards to a half-mile in width, and affords an excellent feeding and nesting ground for Ducks, Grebes, Rails, Coots, etc. At noon we found ourselves at Frenchman's Point at the western end of the Bay; here the ground was boggy and in some places under water. The trees had long been dead, and in many cases all that remained were hollow trunks or merely stumps. All this decay was due to the undermining action of the water which periodically flooded these woods.

On approaching the shore the first sounds to reach our ears were the guttural calls of the Bronzed Grackles, and I soon found that this locality was overrun with these birds and field mice. We had left the canoe and were striking into the woods when the Grackle community set up an unusual hubbub. I hurried to the scene of the commotion and was just in time to see a bird make a well-timed swoop to the ground and clutch a young grackle in its unerring talons; another upward swerve and it had perched on an old ten-foot stump with its victim. The noise the grackles now set up was bedlam let loose, but apparently the least concerned of all present was my new acquaintance the Owl (?)—it must surely be an Owl, but why this hunting in broad daylight, and why that long tail? The parents of the unfortunate grackle youngster now yelled furiously and made two or three sallies close to the Owl, who raised his head and snarled at them with a quivering red tongue. This warning somewhat arrested the "closing in" tactics of the grackles, who were finally subdued by Mrs. Owl appearing on the scene (I afterwards concluded that the female was on her eggs, both this and the following day, when I first entered the woods, on each occasion being warned from her nest by the male's cries. I am now convinced that the nest was some distance back and that this was only their hunting-ground; if I had worked on this theory at the time they might have betrayed their nesting site by their actions. On both days the female apparently remained off her eggs for some time while we were in the woods, but as the sun was very hot this can be readily understood.)

To resume our story; the female perched on a branch of a tree close to the stump which the male had chosen and, with feathers ruffled and wings drooped, gave vent to intermittent spasms of peculiar vibrating sounds, more of a 'squeal'

than a 'voice', apparently intended to intimidate her mate. This behaviour elicited an occasional response from the male, who squealed back, however, with a much greater show of composure. I was now within 40 feet of the Owls, but I might have been 40 miles distant for all the notice they took of me. Whatever concern they lacked, however, was amply compensated for by my excitement, for by this time I had guessed who were my newly-found friends.

The next Owl move was made by the 'missus' who took a noiseless dip to the side of her husband on the stump, this being the occasion for further monkey-chattering from both birds. I was getting my camera into play when the male took a fresh grip of the expiring young grackle and flew off through the woods, hoping, presumably, to get rid of wifey. She followed close on his trail, however, both birds squealing back and forth as they flew, while I followed hastily, hoping to locate their nesting site. They did not go far and I soon came up to them again; the male was perched on a high branch of a large birch, the female below him on the same tree. When their chattering had died down the male busied himself with his victim and proceeded leisurely to divest it of its feathers (the meat was evidently being prepared for the baby owls when hatched). I watched this performance through my binoculars for two or three minutes, during which time the female disappeared from the scene, her departure being absolutely noiseless.

As the male Owl was making such a slow job of it I started to canvass the woods with Old Man Lussier in the hopes of locating the female on her nest in the broken-off top of one of the dead trees. We must have spent nearly three hours canvassing truncated trees without discovering a clue, all the time supposing the female to be incubating her eggs. Here's where luck failed me, however, and my cup of joy remained only half-filled, for the nest was never found.

The sun was sinking low when Old Man Lussier and I arrived back at the spot where we had left the canoe. Taking a last look backwards—loathe to leave my new feathered friends even for the night—my eye caught a 12 foot stump in the middle of a small shallow slough. Perched on the top, silently and patiently watching for his prey, was the male Hawk Owl. I pointed him out to Lussier, who remarked in his broken English, "she's get late," thinking no doubt of something more palatable than Owls (we had eaten nothing since breakfast.) I had with me on this trip a small Premo Camera with a film-pack, expecting to obtain nest-and-eggs pictures only; what was now required was a reflecting camera. I decided to try a picture, however, if I could get close enough, even if I had to tilt the camera considerably. I guessed my first picture at 35 feet; then took a few steps in the water and snapped No. 2 at 25 feet; I became quite excited stalking my game and discovered the camera (?) was shaking a trifle when I snapped No. 3 at about 15 feet; No. 4 was at about 10 feet and still no move on the part of the sphinx! With his yellow eyeballs gazing intently at me I crept a few inches nearer when a whistle from Lussier nearly made me jump; but I refrained from swearing aloud as I was too close to a feathered gentleman in whom I was greatly interested! The next moment the Owl raised his head and gave vent to a few of his peculiar screeches. Was this intended to summon his mate, or what? I looked around to see what Lussier's whistle had meant. He was holding up a field-mouse in his hand and while I watched he knocked over a stump and stamped on some more (nearly every stump in these woods harbored a nest of these rodents). Then I took two or three final steps and came right up to the stump. The owl still intermittently uttered his vibrating cries but showed no signs of departing. Between screeches he would look down at me without expression or sign of fear and I took a picture of him in this pose. For my last attempt I moved around for a side picture to take in the 'hawk' tail. Alas, all these photographs were poorly-timed and distorted! Another whistle from Old Man Lussier and I saw him hold up a field-mouse stuck in the end of a stick which he had cut. This time I understood what he wanted and I told the Owl if he would wait I would get him what he had been hunting for! I splashed over to Lussier and brought back stick and mouse to 'Monsieur Hibou," as Lussier called him, who resumed his programme of squeals even more persistently than before.

It was here that I took special note of the Hawk Owl's notes. With head thrust forward and mouth wide open, displaying a quivering red tongue—altogether a snarling expression—those weird, vibrating and unmusical sounds beat forth. At this distance of only six feet a certain huskiness was perceptible, the vocal chords sounding as if he had 'yelled himself hoarse,' so to speak, but the screeches were not as strong or penetrating as was suggested by the energy displayed in producing them. The birds nearly always cried as they flew through the woods and at a distance their cries have a somewhat uncanny sound. During all my observations I detected little variation in their cries. They apparently have no other call-notes and no 'hoot.'

Having made these mental notes I tentatively held up stick and mouse to the Owl, at which he stopped squealing and cocked his head from one

brethren below. Such is *Empusa grilli*. A third may fall a prey to a wasp. A fourth is parasitized, while others fall victims to birds. Thus it is that the original numbers diminish by more than half, yet a single survival producing eggs may double the previous year's output. In other words for every 50 eggs laid some 48 must be accounted for by death before they mature into adults in order to maintain a balance. A tremendous task for nature to provide for. On the other hand, should this balance fall below the figures indicated then there will be a rapid decline in the grasshopper birth rate and a corresponding reduction in such of their enemies as depend upon them for food. How involved their economic relations are! How unfit are we, with our present knowledge, to judge which one should live or die even to provide for our own benefits!

It may be that in the dim future cultivation will have become intensified and every acre of land be so fully utilized that the old grasshoppers of the plains will have ceased to exist. If that is so then many a bird now prevalent will be rare or extinct. The prospect is not a happy one, and so, in spite of the enormous ravages inflicted, we are inclined to say "long life to the grasshopper."

THE AMERICAN HAWK OWL (*Surnis ulula caparoch*)

BY F. NAPIER SMITH

SATURDAY afternoon, the 22nd May, 1915, I left Montreal for Lochaber, P.Q., to visit the Campbell's Bay Club, a private game club situated on the north shore of the Ottawa River, in Latitude 45° 35′, Longitude 75° 18′, about 25 miles east of Ottawa, Ont.

I had never visited this district and was anxious to observe its avifauna, having been told by members of the Club that it was a veritable bird-paradise. I noted with pleasure that that abomination, the English Sparrow, was conspicuous by its absence, but I regret I did not discover a single specimen of our beautiful Wood Duck which only two years previously was recorded as breeding in the locality. The only ducks I found nesting were the Black and American Golden-eye (Whistler). Altogether, I recorded 77 species, including such interesting birds as the Scarlet Tanager, Rose Breasted Grosbeak, Great Crested Flycatcher, American Woodcock, Wilson's Snipe and a real 'rara avis,' the American Hawk Owl.

On Sunday morning, at 5.30 a.m., "Old Man" Lussier (the Guardian of the Club) and I started off in a canoe to explore the district by land and water. The 'Bay' is virtually a large lagoon, some 2½ miles in length and varying from 200 yards to a half-mile in width, and affords an excellent feeding and nesting ground for Ducks, Grebes, Rails, Coots, etc. At noon we found ourselves at Frenchman's Point at the western end of the Bay; here the ground was boggy and in some places under water. The trees had long been dead, and in many cases all that remained were hollow trunks or merely stumps. All this decay was due to the undermining action of the water which periodically flooded these woods.

On approaching the shore the first sounds to reach our ears were the guttural calls of the Bronzed Grackles, and I soon found that this locality was overrun with these birds and field mice. We had left the canoe and were striking into the woods when the Grackle community set up an unusual hubbub. I hurried to the scene of the commotion and was just in time to see a bird make a well-timed swoop to the ground and clutch a young grackle in its unerring talons; another upward swerve and it had perched on an old ten-foot stump with its victim. The noise the grackles now set up was bedlam let loose, but apparently the least concerned of all present was my new acquaintance the Owl (?)—it must surely be an Owl, but why this hunting in broad daylight, and why that long tail? The parents of the unfortunate grackle youngster now yelled furiously and made two or three sallies close to the Owl, who raised his head and snarled at them with a quivering red tongue. This warning somewhat arrested the "closing in" tactics of the grackles, who were finally subdued by Mrs. Owl appearing on the scene (I afterwards concluded that the female was on her eggs, both this and the following day, when I first entered the woods, on each occasion being warned from her nest by the male's cries. I am now convinced that the nest was some distance back and that this was only their hunting-ground; if I had worked on this theory at the time they might have betrayed their nesting site by their actions. On both days the female apparently remained off her eggs for some time while we were in the woods, but as the sun was very hot this can be readily understood.)

To resume our story; the female perched on a branch of a tree close to the stump which the male had chosen and, with feathers ruffled and wings drooped, gave vent to intermittent spasms of peculiar vibrating sounds, more of a 'squeal'

comprising an area as large as the western peninsula of Ontario. I spent the latter part of June and the first two weeks of July, 1919, with a companion, canoeing through the rivers and lakes of this region, and have compiled the appended list of birds observed during the trip.

Lac la Biche is about 150 miles north-east of Edmonton, and is a beautiful lake on the south side of which the Hudson's Bay Company has maintained a post for many years. The lake is about twenty miles by ten miles in extent and has several fair-sized islands which have been the breeding grounds for such birds as the White Pelican, Double-crested Cormorant and Great Blue Heron, likely for ages, but within recent years the natives claim their numbers are not as great as previously.

Around the lake there are many half-breeds who have taken up land, rather more to be used as their headquarters than for farming operations. The soil is generally white clay and sand on the higher lands, with much muskeg in between the ridges. The lake is noted for its large whitefish, many of them weighing over twelve pounds, and a large industry is carried on with the breeds, who net the fish and sell to the companies, who ship them in refrigerator cars to the large cities of the east.

On the north east corner of the lake the Owl River flows in through a beautiful valley, along which are a number of prosperous looking farms. This country is served by the recently constructed Alberta and Great Waterway railroad, which runs from Edmonton to the northern terminus on the Clearwater river, within a few miles of the village of Ft. McMurray.

About 80 miles north of La Biche my partner and I left the train and packed our canoe and outfit over to Christena Lake, less than one mile, from where we were to commence our river and lake journey. This lake is about twelve miles in length by an average of one mile in width; its water is very clear and cold, and from the number of large whitefish that the breeds and Indians were catching, we concluded this was as valuable as the more southern lake for the industry.

The surrounding country was far from being adapted for agriculture in its present state. The ridges are of white clay and yellow sand, partially covered with a poor growth of poplar and jack pine. Between the elevations were large areas of muskeg with scattered willow and tamarack, some of which was large enough to have commercial value. The soil underlying the muskeg moss has the appearance of being very rich in humus, and some day may be drained and should be capable of producing the hardier varieties of grain. Along the bottoms of the Christena river there were scattered bluffs of good-sized spruce, some measuring nearly three feet at the butt, while the Balm of Gilead was always in evidence and in many places plentiful enough to warrant installation of saw mills. Several large patches of a variety of fern similar to the large ferns in Ontario were found in moist places along the flats.

During our trip through Christena Lake we noticed the scarcity of many ducks, which we thought would be plentiful in this undisturbed country. The general impression has been that all this tremendous region was the summer home of many of the water-fowl, but it was not so, at least as far as the waters over which we travelled were concerned. There were more Mergansers, Buffle Heads and Golden Eyes seen on the river than all other varieties noted during the trip. Some of our common birds were entirely absent, or nearly so; no Meadow Larks or Vesper Sparrows were observed north of La Biche. Ruby-crowned Kinglets, Northern Water-Thrushes and Lincoln's Sparrows were quite common. Every tamarack muskeg resounded with the wonderful three-part song of the Kinglet. On the river we were seldom out of hearing of the Water-Thrush, and whenever a trip was made into the muskegs, Lincoln's Sparrows were heard singing in all directions. This sparrow was the most plentiful bird of the muskeg, where it seemed to be at home in little thickets on any elevation which was not too wet to grow a species of gray willow.

Pine Siskins were very numerous as we neared the Clearwater River, and they could be heard singing from the tops of the highest spruces at any time of the day. No doubt this was their summer home, and it is likely that from localities such as this the large flocks come to us in lower latitudes in the early summer. A couple of Savanna Sparrows were the only ones observed, and they seemed lost on a bit of prairie at the forks of the rivers.

Summer Birds of Lac La Biche and Fort McMurray Regions

1. WESTERN GREBE. Several pairs observed on Christena Lake.

2. RED-NECKED GREBE. Quite a few seen on the larger sloughs.

3. HORNED GREBE. Common in the smaller sloughs.

4. PIED-BILLED GREBE. All the bays in Christena Lake had one or more pairs.

5. GREAT NORTHERN DIVER. Two seen flying from the south towards the lake.

6. AMERICAN HERRING GULL. Many large gulls, thought to be this variety, seen on Lac la Biche.

established limit to the density of population.

By the first, the uncertain and finely adjusted thread upon which some of our species depend for continuance is shown and a possible cause is suggested of the sudden disappearance of such of our birds as the Labrador Duck, Passenger Pigeon, Eskimo Curlew and others for which the human element does not offer an altogether satisfactory explanation.

The recovery of the species from almost nothing to practical normality within half a decade is an indication of how quick and positive is the increase in numbers to be expected from an adaptable race when unfavorable conditions are absent. The Bluebird always suffered somewhat from the small boy and slingshot or flobert rifle combination, the zoologist enthusiast, the collector and, at that date, the millinery trade to some extent. But it shows that in spite of a handicap not amounting to systematic human persecution, a species in harmony with its environment tends to increase rapidly. The converse is also suggested, that species not particularly interfered with by man and yet scarce are so because they lack harmony with their environment and are probably already on the road to natural extinction. We know that species have arisen, flourished and decayed since the beginning and long before man appeared on the scene. Undoubtedly others are undergoing the same process today independently of either the direct or the indirect influence of man. Unless through some fortunate insight into the involved interaction of obscure cause and effect man can control some of the critical destructive factors, most of these species are doomed to ultimate extinction, irrespective of the human attitude. If the Passenger Pigeon had been as well adapted to modern conditions as its near relative, the Mourning Dove, it would not have vanished so suddenly and completely after the last great rookery at Petoskey, Michigan, when all accounts show that there were still hundreds of thousands of birds remaining. The systematic netting and hunting on a large scale ceased with this rookery, and had the birds been fitted to survive there was plenty of stock remaining to have persisted indefinitely, at least in moderate numbers, notwithstanding occasional, irregular or sporadic shooting.

The third lesson taught by this Bluebird episode is the demonstration that there is a saturation point of population for each species beyond which its numbers may not increase. Bluebirds rose from practically nothing to their normal numbers in a few years *and then they stopped short.* It was a remarkable demonstration of the law of Malthus—that a population tends to increase at a geometrical ratio to the full supporting power of the land. What factor it is that prevents its indefinite increase cannot be guessed at with any likelihood of success. Here was a species increasing regularly and rapidly and then, when a certain density of population was reached, there came, without any apparent change in controlling conditions, a sudden dead stop and an indefinitely continued stationary population. As far as we can see, there was no reason why a growth of numbers should be shown in 1896 and not in 1902. We can only acknowledge that there is a factor of control that prohibits an indefinite increase of population.

The points I wish to make are:—

1. That species may be subject to sudden unexpected factors of extinction that human foresight cannot estimate, guard against or control.

2. That strong dominant species have remarkable resources of recovery from depletion which will come into play if the cards are not stacked against them.

3. That a species unadapted to prevailing conditions is doomed to slow or rapid extinction in spite of all man can do to prevent it.

4. That there is a certain density of population for each species relative to the individuals of that species and to competing forms beyond which, under constant conditions, it is impossible to increase.

All these things should be considered and weighed and given their due importance in such conservation methods as we may put into force.

SUMMER BIRDS OF THE LAC LA BICHE AND FORT McMURRAY REGION

BY F. M. FARLEY, CAMROSE, ALBERTA

OF the many portions of western Canada that have received little attention from ornithologists, perhaps none are more outstanding than that country lying between Lac la Biche and Ft. McMurray, at the junction of the Clearwater and Athabaska rivers. This part of Alberta lies between the 55th and 57th degrees of latitude and the 110th and 112th degrees of longitude, being about eighty miles from east to west and one hundred and forty miles from north to south,

comprising an area as large as the western peninsula of Ontario. I spent the latter part of June and the first two weeks of July, 1919, with a companion, canoeing through the rivers and lakes of this region, and have compiled the appended list of birds observed during the trip.

Lac la Biche is about 150 miles north-east of Edmonton, and is a beautiful lake on the south side of which the Hudson's Bay Company has maintained a post for many years. The lake is about twenty miles by ten miles in extent and has several fair-sized islands which have been the breeding grounds for such birds as the White Pelican, Double-crested Cormorant and Great Blue Heron, likely for ages, but within recent years the natives claim their numbers are not as great as previously.

Around the lake there are many half-breeds who have taken up land, rather more to be used as their headquarters than for farming operations. The soil is generally white clay and sand on the higher lands, with much muskeg in between the ridges. The lake is noted for its large whitefish, many of them weighing over twelve pounds, and a large industry is carried on with the breeds, who net the fish and sell to the companies, who ship them in refrigerator cars to the large cities of the east.

On the north east corner of the lake the Owl River flows in through a beautiful valley, along which are a number of prosperous looking farms. This country is served by the recently constructed Alberta and Great Waterway railroad, which runs from Edmonton to the northern terminus on the Clearwater river, within a few miles of the village of Ft. McMurray.

About 80 miles north of La Biche my partner and I left the train and packed our canoe and outfit over to Christena Lake, less than one mile, from where we were to commence our river and lake journey. This lake is about twelve miles in length by an average of one mile in width; its water is very clear and cold, and from the number of large whitefish that the breeds and Indians were catching, we concluded this was as valuable as the more southern lake for the industry.

The surrounding country was far from being adapted for agriculture in its present state. The ridges are of white clay and yellow sand, partially covered with a poor growth of poplar and jack pine. Between the elevations were large areas of muskeg with scattered willow and tamarack, some of which was large enough to have commercial value. The soil underlying the muskeg moss has the appearance of being very rich in humus, and some day may be drained and should be capable of producing the hardier varieties of grain. Along the bottoms of the Christena river there were scattered bluffs of good-sized spruce, some measuring nearly three feet at the butt, while the Balm of Gilead was always in evidence and in many places plentiful enough to warrant installation of saw mills. Several large patches of a variety of fern similar to the large ferns in Ontario were found in moist places along the flats.

During our trip through Christena Lake we noticed the scarcity of many ducks, which we thought would be plentiful in this undisturbed country. The general impression has been that all this tremendous region was the summer home of many of the water-fowl, but it was not so, at least as far as the waters over which we travelled were concerned. There were more Mergansers, Buffle Heads and Golden Eyes seen on the river than all other varieties noted during the trip. Some of our common birds were entirely absent, or nearly so; no Meadow Larks or Vesper Sparrows were observed north of La Biche. Ruby-crowned Kinglets, Northern Water-Thrushes and Lincoln's Sparrows were quite common. Every tamarack muskeg resounded with the wonderful three-part song of the Kinglet. On the river we were seldom out of hearing of the Water-Thrush, and whenever a trip was made into the muskegs, Lincoln's Sparrows were heard singing in all directions. This sparrow was the most plentiful bird of the muskeg, where it seemed to be at home in little thickets on any elevation which was not too wet to grow a species of gray willow.

Pine Siskins were very numerous as we neared the Clearwater River, and they could be heard singing from the tops of the highest spruces at any time of the day. No doubt this was their summer home, and it is likely that from localities such as this the large flocks come to us in lower latitudes in the early summer. A couple of Savanna Sparrows were the only ones observed, and they seemed lost on a bit of prairie at the forks of the rivers.

Summer Birds of Lac La Biche and Fort McMurray Regions

1. WESTERN GREBE. Several pairs observed on Christena Lake.

2. RED-NECKED GREBE. Quite a few seen on the larger sloughs.

3. HORNED GREBE. Common in the smaller sloughs.

4. PIED-BILLED GREBE. All the bays in Christena Lake had one or more pairs.

5. GREAT NORTHERN DIVER. Two seen flying from the south towards the lake.

6. AMERICAN HERRING GULL. Many large gulls, thought to be this variety, seen on Lac la Biche.

established limit to the density of population.

By the first, the uncertain and finely adjusted thread upon which some of our species depend for continuance is shown and a possible cause is suggested of the sudden disappearance of such of our birds as the Labrador Duck, Passenger Pigeon, Eskimo Curlew and others for which the human element does not offer an altogether satisfactory explanation.

The recovery of the species from almost nothing to practical normality within half a decade is an indication of how quick and positive is the increase in numbers to be expected from an adaptable race when unfavorable conditions are absent. The Bluebird always suffered somewhat from the small boy and slingshot or flobert rifle combination, the zoologist enthusiast, the collector and, at that date, the millinery trade to some extent. But it shows that in spite of a handicap not amounting to systematic human persecution, a species in harmony with its environment tends to increase rapidly. The converse is also suggested, that species not particularly interfered with by man and yet scarce are so because they lack harmony with their environment and are probably already on the road to natural extinction. We know that species have arisen, flourished and decayed since the beginning and long before man appeared on the scene. Undoubtedly others are undergoing the same process today independently of either the direct or the indirect influence of man. Unless through some fortunate insight into the involved interaction of obscure cause and effect man can control some of the critical destructive factors, most of these species are doomed to ultimate extinction, irrespective of the human attitude. If the Passenger Pigeon had been as well adapted to modern conditions as its near relative, the Mourning Dove, it would not have vanished so suddenly and completely after the last great rookery at Petoskey, Michigan, when all accounts show that there were still hundreds of thousands of birds remaining. The systematic netting and hunting on a large scale ceased with this rookery, and had the birds been fitted to survive there was plenty of stock remaining to have persisted indefinitely, at least in moderate numbers, notwithstanding occasional, irregular or sporadic shooting.

The third lesson taught by this Bluebird episode is the demonstration that there is a saturation point of population for each species beyond which its numbers may not increase. Bluebirds rose from practically nothing to their normal numbers in a few years *and then they stopped short.* It was a remarkable demonstration of the law of Malthus—that a population tends to increase at a geometrical ratio to the full supporting power of the land. What factor it is that prevents its indefinite increase cannot be guessed at with any likelihood of success. Here was a species increasing regularly and rapidly and then, when a certain density of population was reached, there came, without any apparent change in controlling conditions, a sudden dead stop and an indefinitely continued stationary population. As far as we can see, there was no reason why a growth of numbers should be shown in 1896 and not in 1902. We can only acknowledge that there is a factor of control that prohibits an indefinite increase of population.

The points I wish to make are:—

1. That species may be subject to sudden unexpected factors of extinction that human foresight cannot estimate, guard against or control.

2. That strong dominant species have remarkable resources of recovery from depletion which will come into play if the cards are not stacked against them.

3. That a species unadapted to prevailing conditions is doomed to slow or rapid extinction in spite of all man can do to prevent it.

4. That there is a certain density of population for each species relative to the individuals of that species and to competing forms beyond which, under constant conditions, it is impossible to increase.

All these things should be considered and weighed and given their due importance in such conservation methods as we may put into force.

SUMMER BIRDS OF THE LAC LA BICHE AND FORT McMURRAY REGION

By F. M. Farley, Camrose, Alberta

Of the many portions of western Canada that have received little attention from ornithologists, perhaps none are more outstanding than that country lying between Lac la Biche and Ft. McMurray, at the junction of the Clearwater and Athabaska rivers. This part of Alberta lies between the 55th and 57th degrees of latitude and the 110th and 112th degrees of longitude, being about eighty miles from east to west and one hundred and forty miles from north to south,

the birds seen might have been Rusties.

59. BRONZED GRACKLE. Common at Lac la Biche, nesting in holes of stubs and old woodpecker nests.

60. HOUSE SPARROW. A flock of about twenty of these birds were quite at home in the village of Ft. McMurray. They had evidently come north in a freight car, and when liberated at the end of steel about fifteen miles from McMurray, spied the cluster of buildings in the distance and were soon in their new home; likely a northern record for these birds.

61. SAVANNA SPARROW. Only one pair heard on some open prairie near McMurray.

62. WHITE-THROATED SPARROW. Quite common in the larger woods along the Clearwater River.

63. CHIPPING SPARROW. One recorded.

64. CLAY-COLORED SPARROW. Not nearly as common as farther south. This sparrow prefers the park-like country to the open prairie or heavy timber country.

65. SLATE-COLORED JUNCO. One of the commonest birds everywhere. A nest with eggs was found under a tie on the railway and as the train only passed to and fro once a week the disturbance did not evidently cause the birds much worry.

66. SONG SPARROW. Not common north of Lac la Biche.

67. LINCOLN'S SPARROW. Next to the Junco and White-throat, this was the most plentiful sparrow. Different times I counted as many as a dozen males singing at one time all within a couple of hundred acres. That country must be the great summer home of this splendid singer.

68. SWAMP SPARROW. A few heard singing their monotonous notes along the edges of marshes.

69. ROSE-BREASTED GROSBEAK. Quite common along the river.

70. CLIFF SWALLOW. Several colonies were nesting along the river.

71. TREE SWALLOW. Not common.

72. BANK SWALLOW. Very common, and nesting in all suitable places. One sand bank had fallen away from the rest of the solid earth and many Swallow's nests with eggs were destroyed. The slide had evidently just taken place as the consternation was great among the birds.

73. RED-EYED VIREO. A few heard daily.

74. WARBLING VIREO. More common than the Red-Eyed.

75. BLACK-AND-WHITE WARBLER. Not very common. Frequenting the tamarack in the muskegs.

76. TENNESSEE WARBLER. A few heard in low places close to the river.

77. YELLOW WARBLER. Not nearly as common as they are farther south.

78. MYRTLE WARBLER. Heard daily in the spruces.

79. OVEN BIRD. A few heard.

80. GRINNELL'S WATER-THRUSH. Quite common all along the rivers and lakes.

81. YELLOW THROAT. A few heard, often in the little clumps of brush in the muskegs.

82. HOUSE WREN. Not many heard.

83. RED-BREASTED NUTHATCH. Only one heard.

84. LONG-TAILED CHICKADEE. Fairly common; this was really Hudsonian territory, but careful watching did not reveal this species.

85. RUBY-CROWNED KINGLET. Common in all tamarack muskegs. Before I located my first one I found that these little birds were ventriloquists of no mean order. When looking for this bird I expected that the singer would be as large as a sparrow, judging by the volume of his voice, and was surprised to find it one of our smallest birds. It is certainly a wonderful singer.

86. WILLOW THRUSH. Fairly common.

87. HERMIT THRUSH. Quite common.

88. ROBIN. Very few seen.

89. MOUNTAIN BLUE-BIRD. Three seen flying over our camp one morning.

BOOK NOTICE

DRU DRURY; an eighteenth century Entomologist.

Professor T. D. A. Cockerell, of the University of Colorado, published an interesting account of the life of the above entomologist in *The Scientific Monthly*, January, 1922.

This is a lengthy article and space here only permits us to make a few extracts from the same. Dru Drury was born February 4, 1725. "He is described as of Wood Street in the Parish of St. Alban, London, citizen and goldsmith; afterwards of the Strand, of Enfield and of Turnham Green, all in the county of Middlesex and of Broxbourne, Hereford." He died January 15, 1804, and was buried at the Church of St. Martins in the Fields.

"Regarding Drury's life and work as a whole, we have an excellent example of that innate taste or passion for natural history which inspires a certain number of individuals in every generation and which the majority can neither appreciate nor understand. But we are also struck by the fact that favorable circumstances are needed to render such aptitudes fruitful and of benefit to mankind.

Many such men as Drury, all through the ages, have lived and died without leaving any permanent memorials. The favorable circumstances in Drury's case were especially the organization of zoological and botanical knowledge led by Linnæus, combined with the penetration of nearly every part of the world by British commerce. It was possible to come by the materials for greatly enlarging our knowledge of insects and a method had been devised for conveniently recording discoveries. Drury, taking advantage of these conditions, was able to make important and permanent contributions to the science he loved so much."

Prof. Cockerell in the beginning of his account refers to the correspondence which Drury had with prominent zoologists of his day and to the fact that his letters were copied in a large book. Recently, Prof. Cockerell, while at Funchal, Madeira, was greatly interested to find this letter-book in the possession of Mr. C. O. L. Power, and, borrowing it for a few days, he obtained copies of a number of the more interesting letters and thirty quotations from these appear in the article.

A. G.

REVIEW

The *Auk*, Vol. XXXVIII, 1921, contains the following articles of particular interest to Canadian ornithologists:—

No. 1, January:—

A Nesting of the Philadelphia Vireo. By Harrison Lewis. Pp. 26-44., continued in the succeeding April number on pp. 185-202.

This is an intensive daily account of the nesting of a pair of Philadelphia Vireos, at Bergerville, in the immediate neighborhood of Quebec city, covering the time when the nest was being built, June 12, to when the young left, July 14. Not only does it make another record in the distribution of this rather rare and slightly known Vireo but it is a most excellent demonstration of observation methods in the study of life histories, and shows that whilst the shot-gun may be absolutely necessary in some fields of ornithological investigation there are other valuable lines of work that can be followed bloodlessly. This is nearly a complete field-study of the nesting of this species. The number of American species that this has been accomplished with is pitiably small and is suggestive of the immense amount of work that yet needs to be performed. An important fact to be emphasized in connection with it is that it can be done without special facilities and training other than a certain amount of patience and careful and discriminating observation. Species await the student almost at our back doors.

Further Notes and Observations on the Birds of Hatley, Stanstead County, Quebec, 1919. By H. Mousley. Pp. 51-59.

The paper opens with an introduction describing the special features of the season under discussion and ends with annotations on seven species added to the lists previously published by the author from his locality, bringing them up to 175 species. The most important of these is the Black Rail, an eyesight record but accomplished with details that go far towards making it convincing. The others are all more or less expected.

Notes on North American Birds, X, By Harry C. Oberholser. Pp. 79-82.

This is a technical paper. Holboell's Grebe is declared to be a subspecies of the European and west Asian *Colymbus grisegena*. It is removed to another genus and called *Pedetaithya greisgena major* (Temmink & Schlegel). Should any of our readers ever see this strange name wandering across a page they may recognize in it our old friend *Colymbus holboelli*. He supports the specific distinctness of the American Bittern from the European bird, and will not follow Hartert's claim that it gives but subspecific rank. He unites the Little Brown and the Sandhill Cranes with only subspecific distinction on the ground that size, the only difference between them, intergraduates. Under this conclusion the Little Brown Crane would become *Grus canadensis mexicana*. Wilson's Snipe he regards as only subspecifically distinct from the Old World Jack Snipe and calls it *Gallinago gallinago delicata*. The present reviewer is not in a position at present writing to question any of these proposals and whether they can stand or not can only be determined by the careful examination of material.

The Geographic Races of *Cyanocitta cristata*. By Harry C. Oberholser. Pp. 83-89.

In this, Mr. Oberholser divides our old friend the Blue Jay into northern and southern races. The type form he restricts to the southern and southeastern States. The northern race, including all Canadian specimens, is named *Cyanocitta cristata bromia*. The differences are those of size, in which extremes overlap, and color. *Bromia* is the larger, less purplish in the blue of the upper parts, and larger white tips to greater coverts, tertials, secondaries and retrices.

In the report of the Thirty-eighth Annual Meeting of the American Ornithologists Union,

held in Washington, Nov. 8-11, we note the names of eight new Canadian Associates.

Under General Notes:—

The Horned Grebe at Hatley, Stanstead County, Quebec. By H. Mousley. P. 108. This species is added to the local list.

The Grasshopper Sparrow in the Montreal District. By L. McI. Terrill. Pp. 115-116. A colony including three singing males is reported from Chambly Co., Que., June 26 and July 5, 1920. Specimens were taken and the record placed on a firm basis. As much cannot be said for an incidental record of the Orchard Oriole seen at Lacolle, on the Richelieu River, seasons of 1916 and 1920. A Towhee seen at Chambly also on the Richelieu is much less remarkable.

Additions to the Birds of Lake County, Minnesota. By Chas. E. Johnson, Pp. 124-126. This is in addition to a list for same locality published in *Auk*, October, 1920. It is interesting to Canadian students as being adjacent to our Rainy River country where no ornithological work has been done, and is suggestive of what may be expected there. It adds seventeen species to the previous list.

Three Important Records from Hatley, Stanstead County, Quebec. By H. Mousley. Pp. 126-127.

This reports a re-occurence of Bartramian Sandpiper in the locality, adds the Mourning Warbler to the local list, bringing it to 177 species, and announces the breeding of the Yellow-bellied Flycatcher.

Ornithological Notes from Southeastern Alaska. By Geo. Willett. Pp. 127-129. This is interesting to ornithologists on the west coast. It applies mostly to Prince of Wales Island and the Wrangell neighborhood, and consists of annotations on 18 species, including records of Yellow-billed Loon and Pygmy Owl for the vicinity of Wrangell.

Under Notes and News appears an obituary of Professor John Macoun.

No. 2, April:—

The Nesting of the Philadelphia Vireo. By H. F. Lewis. Continued as previously noted.

The History and Purposes of Bird Banding. By Frederick C. Lincoln. Pp. 217-228.

Recent Returns from Trapping and Banding Birds. By S. Prentis Baldwin. Pp. 228-237.

The Marriage Relations of the House Wren. By S. Prentis Baldwin. Pp. 237-244.

These are intensely interesting papers. Mr. Baldwin's work has been mentioned in these reviews before. He developed genealogical tables for his wrens and the involved relationships so brought to light are amusing, if rather irregular according to human standards. This banding work promises to become one of the most important methods of ornithological investigation.

The English Sparrow and the Motor Vehicle. By W. H. Bertgold, pp. 244-250. This demonstrates the great reduction of the English Sparrow that has taken place in the city of Denver, Colorado, since the more general substitution of motor for horse-drawn vehicles. It substantiates a process of relief that has been noted by other observers.

Sixth Annual List of Proposed Changes in the A.O.U. Check-List of North American Birds. By Harry C. Oberholser. Pp. 264-269. As these are only proposals and have not yet been adopted by the Committee on Nomenclature or affirmed by any considerable body of ornithologists it is necessary to mention only those most important to us. Most of them are purely nomenclatural. W. S. Brooks describes a new *species* of Canada Jay from Anticosti Island, Gulf of St. Lawrence, under the name of *Perisoreus barbouri* Brooks, *Pro. New Eng. Zool. Club*, VII, March 11, 1920, p. 49. Giving this form full specific status is doubtless due to a disregard of the subspecific conception in total. That the slight isolation of Anticosti should develop a recognizable subspecies is remarkable enough. That it should originate a full specise in the present accepted meaning of the term is almost unthinkable. So scanty is the material from this out-of-the-way locality that few if any are able to judge the value of the proposal. The new Cliff Swallow, *Petrocheledon albifrons hypopolia* Oberholser, described in these pages, 1919, and supposed to breed from Montana to Alaska is mentioned. It may be well in this connection to state that the present reviewer has compared a considerable series of this bird and can find no such distinctions as is postulated by the describer. *Thryomanes bewicki arborius* Oberholser. *Wilson Bulletin*, XXXII, March 27, 1920. A new subspecies of Bewick's Wren is proposed for southwestern British Columbia, replacing in part Vigor's Wren, hitherto attributed to that locality.

In General Notes appear the following:—

The Blue Goose in the Province of Quebec. By Harrison F. Lewis. Pp. 270-271. This note records the taking of this rare species at Cap Tourmente, Montmorency Co., P.Q., Oct. 10, 1917, and another Oct. 16, 1920. Both specimens were examined mounted by the recorder. The regular migration of this species seems to be down through Manitoba and the interior. Their occurrences are so irregularly distributed as to suggest that they make their long migrational flight from the east side of James and Hudson Bay to the Gulf of Mexico, the only localities where they are known to occur regularly in num-

bers, in two or three long flights. The occurrence of stragglers from the line of this migration route is a matter of considerable interest. It may be noted that the following paragraph reports the taking of similar specimens in Massachusets in the falls of 1914 and 1920.

A Late Record of the Red-backed Sandpiper. By Nelson Gowanlock. P. 273. Reports the taking of a specimen of that species near Gimli, Lake Winnipeg, June 27, 1916.

Mortality among Chimney Swifts. By Harrison F. Lewis. Pp. 275-276. Reports, on the authority of Mr. E. C. Allen, the taking of 1175 dead and 100 living Chimney Swifts from a chimney flue of a church in Truro, N.S., in late May (?), 1919. The weather had been very inclement and it appeared that the birds had taken refuge in the chimney, where they were suffocated when the fires were lighted.

An Attack on Live-stock by Magpies. By A. W. Schorger. Pp. 276. This describes the methods by which Magpies in a limited district of Utah enlarged or even originated sores on the backs of sheep and in some cases of cattle until serious damage was done, at least one case ending fatally. This is a most interesting case, paralleling as it does the origination of a similar destructive habit by the Kea Parrots in New Zealand. There have been other cases of this reported against the Magpie in recent literature and probably there will be more said about it in these pages later.

Hooded Warbler on Belle Isle, Detroit. By Etta S. Wilson. P. 281. This substantiates a previous record made by B. H. Swales for this same locality, *Auk*, 1920, p. 463. It seems that Miss Wilson saw what was supposedly the same bird a few hours earlier in the day, May 6, 1920. Belle Isle is within a quarter of a mile of the International Boundary and hence the corroboration of the record is of nearly as much interest to Ontario as to Michigan observers.

Under Recent Literature:—

The Economic Value of the Starling in the United States. By E. R. Kalmbach and I. N. Gabrielson, *U.S. Dept. of Agr., Bulletin* No. 868, pp. 1-66, four plates and several diagrams, is reviewed.

This is a history of the bird's introduction and spread in the United States and a detailed account of its economic possibilities. As the species seems to be extending and headed towards Canada, via southern Ontario, all interested in either the birds or fruit-growing in the threatened districts should obtain copies of this report and shape their reception to the newcomer accordingly. It may be obtained from the Department of Public Documents, Washington, for a few cents.

No. 3, July:—

Which Sex Selects the Nesting Locality. By H. Mousley, Pp. 321-328. This paper is a development and extension of Mr. Mousley's studies of nesting habits previously appearing in the *Auk* under title of 'The Singing Tree and Subsequent Nestings.' It is thoroughly in harmony with Howard's Territory in Bird Life already reviewed in these pages and substantiates much of it. Mr. Mousley decides that amongst the general run of small land birds it is the male that establishes the general neighborhood of the nesting site but the female picks the exact spot. Arriving in spring ahead of the female he selects his summer range and in it a "Singing Tree" from which he can survey his domain, watch for intruders and advertise his presence to passing females, one of which in the normal course of events he accepts as mate. Henceforth until the female locates her nest site the "Singing Tree" acts as a trysting place that holds the pair together; later the nest itself forms the mutual meeting place. In some species, probably those in which both sexes assist in construction, as in the Chickadee, the nest is located by joint agreement between the pair. In the case of the Ruffed Grouse, a polygamous bird, the nest is entirely the care of the female and the sexes go and come independently of each other, but the females are able to find the male whenever necessary by repairing to his drumming log whence his reverberating roll advertises his presence.

Moulds and Bacteria on Egg Collections. By Frederick H. Kennard. Pp. 345-356.

Mr. Kennard for some time has been investigating a destructive mould on eggs in zoological collections. This mould, a tawny bacillus, *Mesentericus fuscus*, flourishes in dry atmosphere and is alarmingly prevalent amongst American collections. His remedy is to wash eggs carefully with Bon-Ami to remove the spots already formed and then immerse, blow holes down, in a solution of mercuric bichloride, 1 to 500; under home conditions, for three to five minutes. The eggs are then washed in running water five to ten minutes according to size and texture. Details of technic are given.

Description of a new Loon. By Louis B. Bishop, M.D. Pp. 264-270. In this the Loons from our prairie provinces westward and the adjoining United States south to northern California are separated from the type form under the name *Gavia immer ellasson* Bishop. It is distinguished by being slightly smaller.

The Mockingbird in the Boston Region and in New England and Canada. By Horace W. Wright. Pp. 382-432. A posthumous paper, for the author died in June, 1920. As is stated in a

note, p. 490, the expense of publication was borne by his sister, Miss Mary Wright. It is a comprehensive and detailed account of the occurrence of the species along the northern border of its range. As far as Canada is concerned most of the old records are cited, Sable Island, that extraordinary sandpit lost in the sea off our east coast where so many unexpected waifs have strayed, Truro, N.S., St. John, N.B., Anticosti Island and Godbout, P.Q. and Strathroy, Chatham, Pt. Pelee and Hamilton, Ont. Most of these casual records are well substantiated but some should probably be re-examined. The paper shows a great amount of research but it is evident that the author was less well acquainted with Canadian literature than he might have been. This may have been due to editing or completion under subsequent hands.

The Name of the Eastern Hermit Thrush. By Outram Bangs and Thomas E. Penard. Pp. 432-434.

It is stated that the subspecific term *pallasi* that has long been applied to the eastern form of the Hermit Thrush was first applied to the type form *guttata* and is therefore a synonym for it. This leaves our eastern bird without a name; that of *faxoni* is proposed, thus making the Hermit Thrush of eastern America *Hylocichla guttata faxoni* Bangs and Penard.

In General Notes appear:—

American Common Tern Recovered in West Africa. By Frederick C. Lincoln. P. 453. A striking example of the value of the banding methods of migration study now being developed. A Common Tern banded July 3, 1913, on Muscongus Bay, Me., by Dr. J. C. Phillips, was taken in August, 1917, on the Niger River Delta in West Africa. It was well known that the Common Tern migrated down both sides of the Atlantic but this evidence that American birds ever pass over to the east side of these vast waters or *vice versa* comes with a considerable shock of surprise. There is evidently more intermixture of New and Old World blood going on than we ever suspected.

King Eider in Michigan Waters. By Etta S. Wilson. Pp. 454-455. Reporting the King Eider through the winter of 1920 and 1921 on the St. Clair River. Also reported from Jack Miner's place near Kingsville, Ont. An unusual number of Snowy Owls were also taken the same season.

Magpies and Live Stock. By T. C. Stephens. Pp. 458-459. Further notes on the attacks on live stock by Magpies, in the Black Hills of North Dakota, and in Nebraska. The indications are that the habit is newly developed and though wide-spread is local and perhaps individual. The evidence shows, however, that the birds in some cases attack healthy animals (those free from sores or wounds.).

The Black-backed Kamchatkan Wagtail. By John E. Thayer and Outram Bangs. Reports the capture of a specimen on one of the outermost of the Aleutian Islands, May 4, 1913, thus adding the species to the North American list.

The Criterion of the Trinomils. By Jos. Grinnell. In this the writer takes exception to the methods of presentation followed by Mr. Oberholser in his claim of the specific identity of the Sand-hill and Little Brown Cranes. He notes that intergraduation in size is exhibited by a large series of measurements but wants to know what those measurements are and to be assured that similar birds were compared and not young, poorly developed Sandhills with adult Little Browns. The point is well taken. We are not prepared to take the say-so of any authority upon an important question without having access to the evidence upon which it is based. He also raises the question of whether in examinations of such character "obvious 'sports,' a runt say" should be disregarded as falling "outside of the polygon of normal variation in the species." He also stresses the necessity of adhering strictly to the intergradation criterion of subspecific status. He deprecates the use of such inferences as that a "form is clearly a Geographic race" and therefore subspecific without intergradation being shown to exist, claiming that species as well as subspecies can originate through geographic influences, a conclusion that seems too obvious to dispute.

Under Recent Literature:—

Mabbot on the Food of Shoal Water Ducks. *Bull.* 862, *U.S. Dept. Agri.*, Dec. 1920, price 25cts. from Supt. Public Documents, Washington. This is a resume of the food habits of Gadwall, Baldpate, Teal, Pintail and Wood Duck. The Mallard and Black Duck were similarly reported on by McAtee in *Bull.* 720, of the same series in 1918.

Lincoln's Instructions in Bird Banding, *U.S. Dept. Agr., Circular* 170, price 5cts. from Dept. Public Documents, Washington. Mr. Lincoln has charge of the bird-banding activities of the Bureau of Biological Survey. This circular consists of instructions in methods and procedure.

Nesting of the American Hawk Owl, *Oologist*, XXXVIII, March 1, 1921. By E. S. Norman of Kalavala, Man. is noted.

A Revision of the Races of *Dendroica audubon*i., *Ohio Journal of Science*, XXI, May, 1921. By H. C. Oberholser. Four races of the species are recognized. It is not apparent from the context which of these he refers to our western provinces.

Under Notes and News occurs a paragraph of peculiar interest to those interested in the minor scientific publications. It appears that even so well established and financed an organ as the *Auk* is feeling the effects of the high cost of and disturbances in the printing industry and it has had to appeal to sources outside its regular subscription list for the sinews of war. It has been glad to receive a financial donation from the National Association of Audubon Societies, and two of the heaviest papers published in the year were at the expense of Miss Mary Wright and Mr. Prentiss Baldwin. Besides this, for the first time within the memory of the reviewer, the *Auk* has appeared three months late. It is catching up now and the January number of the present volume was received towards the end of February. However, it is indicative of the times, prices have soared so that with this Canadian Field-Naturalist we are attempting to publish for $1.50, numbers that cost us $3.10. It is evident that this can not continue long. Our subscribers, ignorant of conditions, can hardly be blamed if they think they have a valid cause of complaint against us, but the lowered standard of paper, illustration, mailing and our general lateness of appearance as well as the regrettable doubling up of numbers has been the result of grim necessity. It is at present up to the general naturalist public of Canada whether the attempt to continue a Natural History publication (practically the only one in Canada) is to fail or not. This is not a private venture. No one profits in any financial degree by its success, though numbers of us may be substantially responsible if it fails. It is published entirely as a source of publication and information for Canadian naturalists and for the general good. There is no fault in the present condition of the Canadian Field-Naturalist that funds will not repair. More new subscribers are absolutely essential and in the meantime we plead for consideration from the older ones. It is right up to the naturalists of Canada whether they wish to continue a national source of scientific publication or are satisfied to rely upon the courtesy (always freely extended as far as space permits) of foreign publications.

No. 4, October:—

Breeding Birds of Warland, Lincoln Co., Montana. By Thomas E. Burleigh. Pp. 552-565. An annotated list of summer birds from a point on the Kootenai River very close to the Southern British Columbia Boundary. It is of suggestive interest to workers in that section.

Under General Notes occur:—

Double-crested Cormorant in Ontario. By M. J. Magee, p. 597. The occurrence of six birds Aug. 4 to 21, 1921, near Gargantua, Ont., near eastern end of Lake Superior.

Note on the Breeding of the Semipalmated Plover in Nova Scotia. By Chas. W. Townsend, M.D. P. 601. Refers to Lewis' report of eggs in Yarmouth Co. and his own record of downy young at Seal Island previously published. Adds a record of birds playing wounded as if with young on shore of Barrington Bay near Coffinscroft, N.S., July 1, 1921.

Evening Grosbeak in Michigan. By M. J. Magee. P. 604. Reports birds summering at Hulbert, Mich., some forty miles west of Sault Ste. Marie. Also occurrence of adults and immatures scarcely able to fly, Aug. 24, at Sault Ste. Marie, Mich. It seems that at last we are running down the nesting grounds of this mysterious species.

Goldfinches and Purple Finches Wintering at Hatley, Stanstead County, Quebec. By H. Mousley. P. 606. The title suggests the general tenor of this note but the author calls attention to a little known or unusual taste for salt noted in some birds, Purple Finch, House Sparrow, Mourning Dove and Crow.

The Philadelphia Vireo in the Province of Quebec. By H. Mousley. P. 607. Calling Mr. Lewis' attention to overlooked records made by himself. It may be said parenthetically here that these records were published after the above manuscript had been prepared and was beyond the writer's control.

Golden-winged Warbler at Sault Ste. Marie, Mich. By M. J. Magee. P. 607. A sight record of this species near the above place. It is certainly a northern record, too far north to be accepted as it stands and without further details.

Early Spring Records at Hatley, Stanstead County, Que. By H. Mousley. P. 609. A number of unusually early spring records for the locality.

Early Bird Banding. By Ernest Thompson Seton. P. 611. Description of early attempts by writer in marking birds with ink spots and small lockets, near Carberry, from 1882 to 1884.

P. A. T.



DENIZENS OF THE HEIGHTS—ROCKY MOUNTAIN GOATS

Courtesy of Canadian National Parks Branch, Department of the Interior *Photo Byron Harmon*

The Canadian Field-Naturalist

VOL. XXXVI OTTAWA, ONT., MAY, 1922 No. 5

ADVENTURES WITH THE CANADA GOOSE

By P. A. Taverner

(*Published by permission of the Director of the Victoria Memorial Museum, Ottawa, Ont.*)

OUR old friend, Jack Miner, of Canada Goose fame, professes unbounded admiration for the moral and mental excellencies of the Canada Goose. While his superlatives in this connection may have a flavor of the exaggeration of enthusiasm, it is not at all certain that Jack does not understand goose nature better than do some of us Doubting Thomas skeptics. Certainly Canada Geese make model spouses and most devoted parents. A drake mates only for the occasion, and enjoys a sensuous honeymoon, but refuses the further responsibilities of his actions, and leads a care-free existence with other gay bachelors and grass widowers in stag-parties on the open lakes and marshes while his conscientious duck alone shoulders the drab, exacting duties of raising the brood to maturity. Quite otherwise is it with the gander of *Branta canadensis*; he mates for life, standing watch and ward over mate, eggs and young, co-operates in protection, unites in self-sacrifice and holds to his mate till death doth them part. Some of the following experiences go a way in substantiating Mr. Miner's oft-expressed opinions.

It was on Cypress Lake, Saskatchewan, in the summer of 1921. We were in a rowboat with an outboard motor when we saw a family of geese, the pair of adults and four downy young but a few days from the egg, on the lake ahead. When they became aware that our progress was carrying us uncomfortably near, they edged towards the shore, slowly and openly at first, apparently not appreciating the unusual swiftness of our approach. Then they put on more speed, and arranged themselves in a long single file, one parent leading, the other bringing up the rear, swimming low, and both with their long necks outstretched and laid down flat on the water, making themselves as inconspicuous as possible. The young, coaxed from ahead and urged from behind, paddled along vigorously between, one close behind the other. From our low and distant point of view, the effect was interesting. They looked like a floating stick. Certainly they would not impress the casual eye as a family of Canada Geese and if we had not first seen them in a more characteristic pose they would undoubtedly have been passed without recognition. If our speed had been derived from oars or paddles, it would have taken a considerable chase to have caught them, but the engine gave us an unfair advantage and one they had not counted on, for in a moment we were upon them.

We tried desperately to get the graflex to bear upon them whilst they were in this peculiar lock-step formation. But even a long focus lens demands close quarters to make an appreciable image of even so large a bird as a goose and just before we were ready to take the shot the birds realized that concealment had failed and that other tactics were necessary. The parents raised their heads and, flapping their wings, endeavoured to get a higher burst of speed out of their charges. Failing in this, the gander,* calling loudly and excitedly, splashed off ahead for a few yards, looked back to see that the goslings could not follow, and flapped helplessly on over the water. The goose hesitated a moment and then joined her mate whilst the youngsters, still little more than fluffy balls of down, bunched irresolutely and then one and all dove and disappeared from sight. During the next few minutes the old birds scurried back and forth over the water in our immediate vicinity, playing the old familiar broken-wing deceit to decoy us away, occasionally rising and flying a few hundred yards, only to circle back to renew the attempts to coax us off, all the time honking loudly in a high shrill key that revealed the agony of their

*As I have no means of determining the sex of the parent birds, it is assumed for the purposes of this story that the gander led.

anxiety. Meanwhile the little ones bobbed to the surface in a scattered bunch like a handful of yellow corks, saw us and ducked again, came up more scattered still and disappeared immediately. They rapidly became more expert in their bobbing and diving and soon indicated their rising only by an instantaneous glimpse of a dull yellow spot in a swirl of cloudy water. The camera was confusedly pointed this way and that, but so quick were the subjects that no snap could be made, and all the while they kept scattering and getting farther apart until finally we were left, with a virgin camera, vainly waiting the reappearance of the last gosling seen, and there was nothing but empty lake before us with a pair of anxious parent geese still endeavouring to decoy us away—but from a safer distance and with considerably less recklessness. We withdrew rather crestfallen, but before we lost sight of them we could see that the little family was reunited and making for the grassy marsh where there was cover for young geese and safety from motor boats.

This was interesting of course as a demonstration of the ability of the young to scatter and hide on the open lake, but, except for the first line-formation with the long conspicuous parental necks prone on the water, not different from the actions of any of the ducks under similar circumstances.

Foiled in obtaining photographs this time, when we discovered another similar family a few minutes later, we resorted to more cautious tactics. The brood formed in line in the same manner as before, but instead of rushing in at full speed, we slowly edged them in towards shore. Here there was a narrow, sandy mud wash at the foot of a steep embankment some twelve inches high. On top of this was a dry flat, covered with scanty grass and sage clumps, rising gradually at first, then more steeply, to a bare hill a hundred yards back. They gradually worked in to this shore. On being pushed a little too hard, the goose again splashed off. Seeing that a repetition of the former fruitless tactics was about to follow, we paused and let the gander herd his charges shorewards. They landed and climbed the bank, the gander leading, erect to his fullest extent and honking loudly, calling to us to follow. The brood came close after him. In the meantime, the goose, which had first left towards the right, had desisted from her exertions to lead us in that direction and had circled about us, and now appeared approaching the shore at our right where she also landed and occasionally answered her mate. The youngsters, toddling after the gander, at the first short grassy cover suddenly changed their course at right angles and with it their mode of travel. Hitherto openly intent only on speed, without any attempt to hide, now with heads low and sinuous movement, they moused through the scanty herbage, taking advantage of every little grassy clump, and so just could be seen, glinting through the dull shadows in the sere yellow background. They followed parallel



"We . . . let the gander herd his charges shorewards"

to the shore until opposite the waiting goose and then came out to where she waited to receive them and they all took to water again and paddled off quietly and inconspicuously whilst the loud-calling gander on the bare hill-side watched the results of the ruse anxiously and continued his conspicuous demonstrations to keep our attention on him. The whole little comedy was admirably worked out, obviously on the spur of the moment, and I doubt if, given the same conditions, human intelligence could have evolved a better ruse for the safety of the little family.

It was notable that, though several times afterward we cruised this part of the lake, and knew that these geese families were still present, we never had such an opportunity again. It is my experience that birds learn much by one lesson. Opportunities for successful photographing occur unexpectedly with certain birds once only. If they are not taken advantage of then, the chance is unlikely to be repeated. Birds with a nest are sometimes badly flustered when surprised, and if one is prepared to take advantage of the circumstance, good pictures may be obtained—but one must work quickly and immediately. The first swoops of the parent hawk are usually the closest and most daring, and on a return visit of the intruder more wary tactics are generally pursued. At any rate all we saw of these geese again was the stick-like line disappearing in the reedy cover far in advance of us and doubtless the first sound of our *put-put* in the distance was the signal for them to forsake the open water and make for cover. We had caught them in the open once, but they did not permit us to do so again. There on the lake where heretofore open water was salvation against all danger, they had learned at one lesson its futility against our speed and power and had reorganized their whole system of protection.

A letter recently received from Mr. H. A. P. Smith of Digby, Nova Scotia, contains so much of interest in this connection, and an account of some habits of the species that but rarely find their way into our text books and life histories, that I asked the writer's permission to publish it. The following is but a slightly edited copy of his account.

"I certainly believe that the Canada Goose is the wisest of game birds. For a number of years I bred wild geese on a friend's farm at the head of St. Mary's Bay. These were virtually wild. They were allowed their liberty and flew about over the big salt marshes as they liked during the months of the close season for wild fowl. I found that the birds did not mate until they were *four years old*. I took great pleasure with the geese and used them for decoys. My regular 'shooting team' became very tame and I firmly believe that they knew their names.

"On one occasion when I was shooting geese at Barrington Bay in January, I was surprised by a large flock of geese coming to water. Canada Geese must have fresh water at least once a day. I was waiting near where a spring of water trickled down from the rocky cliff where the geese came at high tide at night for water. Several evenings I waited here for the birds to come in with the tide for water. It was very dark but I could hear the big flock out in the bay some 150 yards out having a great time. Occasionally they would quiet for a few minutes and then again all honk and talk together. Some two weeks afterwards I was at the same place waiting in the moonlight, and the geese were off shore again making the usual fuss. Suddenly they quieted and I noticed a bunch of birds which I took to be Black Ducks swimming in to the water hole. They came, drank, and disappeared again like shadows, perfectly noiselessly. After they had disappeared in the direction of the geese that had been talking there was a great honking again. This was repeated again very soon and I saw another bunch of birds swim in and drink and all was quiet until they had rejoined the flock when the usual racket took place. I decided that if any more Black Ducks swam in I would shoot at them. Presently they came, silent as death except for the gurgling of water and the rattle of pebbles as they drank. I shot and killed five geese.

"Now, the question was, why did the geese act in this manner? I sat in camp and tried to reason it out. At last I came to the conclusion that the birds made the noise off shore to hide the others coming in and to advertise the fact that they were not near shore. When the incoming bunch drew near the danger point, the others quieted so that those near the drinking place could hear any movement on shore and retire on evidence of attack from the bushes. An enemy passing or listening for them would think they were off in the bay and out of range. No doubt more than one gunner has listened to the geese and wished that they would come in closer under similar circumstances. A friend of mine says that if a Black Duck had a neck as long as a goose's it would be the hardest of our game birds to approach, but I incline to the belief that the Canada Goose, in a district where it has been hunted, is the wisest bird that flies."

THE DISTRIBUTION OF THE OTTAWA TRENTON ECHINODERM FAUNAS

BY A. F. FOERSTE

THE Trenton limestone of the Ottawa area is characterized by an interesting fauna, part of which is very restricted in its geographical distribution. This is true especially of its echinoderms, including the cystids, crinoids, and starfish, which are represented by a considerable variety of species, some of which are fairly common. The same species as those found at Ottawa, or closely related forms, occur also 170 miles south west of Ottawa, at Kirkfield, on the Trent canal, between Simcoe and Balsam Lakes. These two localities, Ottawa and Kirkfield, are widely known for the richness of their Trenton echinoderm faunas. A small exposure on Goat Island, northeast of Little Current, on Manitoulin Island, 300 miles almost directly west of Ottawa, has furnished a small echinoderm fauna of such variety that it is probable that if considerable exposures were at hand, the number of species here also would be considerable. This Goat Island fauna evidently is closely related to that found in the Trenton at Ottawa. Farther westward the Trenton echinoderm fauna of the Ottawa area is represented only by occasional species.

Six hundred miles west of Ottawa, on the Escanaba River, northwest of Green Bay, an arm of Lake Michigan, in section 17 of township 41 of range 23, the very characteristic Ottawa species, *Comarocystites punctatus* Billings, occurs associated with the widely distributed species *Pasceolus globosus* Billings, and with the New York Trenton species, *Schizocrinus nodosus* Hall. About 10 or 20 feet farther up, another New York Trenton species, *Cheirocrinus anatiformis* (Hall), is found. These species were collected long ago by Dr. Carl Rominger, at that time State Geologist of Michigan (Geological Survey of Michigan, Vol. I, 1873, pp. 58-60). Recently the writer had an opportunity of examining the original specimens of *Comarocystites* and *Pasceolus* collected by Rominger, and now deposited in the Geological Museum belonging to the University of Michigan. The *Comarocystites* specimen, numbered 5405, evidently is a typical representative of the species *C. punctatus*, as recognized already by Rominger.

The specimen of *Pasceolus*, numbered 5403, however, was described by Rominger in the following paragraph which leaves its identity unestablished:

"BRYOZOA.—*Chætetes petropolitanus, Chætetes ramosus*, and several other forms, of which one is interesting enough to be described here. It is of small mummiform shape, with conspicuous solid dots, formed by closed tubes and closed finer interstitial cells. These solid dots in some specimens project like warts, and are surrounded by a depressed polygonal area, which gives the surface a striking similarity with a compound star-coral. Perfectly identical specimens also occur in the Trenton limestone of Canada, near Ottawa river, and are preserved in the collections of the Geological Survey at Montreal."

The preceding description becomes readily intelligible, when compared with the specimen belonging at present to the University of Michigan. The latter is depressed globose in form, 33 mm. in diameter, and 22 mm. in height. It is covered with numerous hexagonal and pentagonal plates averaging from 3 to 3.5 mm. in diameter. The sutures between these plates are clearly defined. The central part of the plates is depressed, and from this depressed area grooves radiate outward in a stellate manner toward the angles of the plates, usually disappearing before reaching the latter. It is these stellate grooves which suggested to Rominger a striking similarity with a compound star-coral. All specimens of *Pasceolus globosus* do not show these stellate grooves. In some specimens the plates present moderately convex surfaces, suggesting to Rominger solid dots, projecting like warts. The appearance of warts projecting from the general mass is due to weathering, which has left narrow grooves between some of the plates. There are no interstitial cells; Rominger was deceived by irregularities along some of the sutures. A break across one of the plates, parallel to its surface, shows that what appear as sutures at the surface are in reality vertical walls, very thin, which can be traced for a distance of 1 mm. beneath the surface, but no other structure can be observed in the interior of the Escanaba specimen.

At present there is a tendency to regard *Pasceolus* as one of the calcareous algæ in which a central space is surrounded by a single spherical layer of cells completely shutting off the interior cavity. The cells present polygonal outlines due to lateral pressure. The walls separating the cells are very thin. The outer walls, facing the exterior, are either concave and with stellate grooves, or convex and without any other con-

spicuous markings. The inner walls are convex toward the interior, and, in certain species, present a short central spine projecting toward the center of the cavity. In the Escanaba specimen the inner walls do not appear to be preserved.

It is possible that two genera occur among the species formerly referred to *Pasceolus*. Bassler refers the two species from the Gun River member of the Anticostian series of strata, *Pasceolus gregarius* Billings and *Pasceolus intermedius* Billings, to the genus *Nidulites;* however, the reason for this association is not stated.

The Escanaba specimen of *Comarocystites punctatuts* Billings retains 22 complete thecal plates. Among these is the plate bordering the anal opening on the right, and the one bordering it on the left is almost entire but has been crowded against the former. A part of the basal support of the pair of brachioles nearest the anal opening is present; and a trace of the basal support of the second pair of brachioles, more distant from the anal opening, may be detected. Below the level of these basal supports for the brachioles the thecal plates best preserved are arranged in 5 transverse rows, with indications of 2 rows beneath. Evidently two or three additional transverse rows of plates must have intervened between the lowest part of the specimen and the top of the column. Along the level of the anal opening and just beneath the latter, the number of thecal plates in the transverse rows is 6 or 7, indicating that nearly the entire width of the theca is presented, but pressed flat previous to fossilization. In this flattened condition 6 plates form a width of 35 mm. The plates are of the same size as in typical *Comarocystites punctatus*, and present the same degree of concavity, but apparently are much thinner than in most specimens found at Ottawa. The plates are built up of vertical lamellæ occupying triangular fields whose apices meet at the centers of the plates, and whose bases are formed in each field by one of the sutures between adjacent plates. About 10 of these vertical lamellæ, parallel within the same field, occupy a width of 3 mm. The pores between the lamellæ tend to be arranged in transverse rows, but with numerous irregularities. Several of the plates preserve some of the pustulose elevations noted on the exterior surface of the thecal plates of typical specimens of this species (*Ottawa Naturalist*, 30, 1916, pl. 2, figs. 1A, 1B, and 1D.).

Aside from the occurrence of the typical species at Ottawa and on the Escanaba river, *Comarocystites* is known only from the Kimmswick member of the Black River formation at Cape Girardeau, Missouri, and at West Kimmswick in the same state, where it is represented by *Comarocystites shumardi* Meek and Worthen.

Pasceolus globosus, on the contrary, is more widely distributed. It is listed by Ulrich from the lower or *Clitambonites* member of the Prosser formation in the Minnesota area (Geol. Survey Minnesota, III, pt. 2, page cxxiii); and it occurs in the upper of Cynthiana member of the Trenton near Ivor, east of Cinncinati, Ohio, although the latter horizon is much higher than any part of the Trenton in the Ottawa area.

Among the genera known at present in the Trenton only from Ottawa and Kirkfield in southern Ontario are *Astrocystites*, *Atelocystites*, *Glyptocystites*, *Ottawacrinus*, *Palæocrinus*, *Periglyptocrinus*, *Petraster*, and *Protaxocrinus*. Of these *Palæocrinus* is known as far east as Montreal during the Chazyan, but not during the Trenton.

Among genera known in the Trenton of Canada only from Ottawa and Kirkfield, but occurring also in the Curdsville member at the base of the Trenton in Kentucky, are *Amygdalocytsites*, *Cleiocrinus*, *Edrioaster*, *Glyptocrinus*, *Hybocrinus Hybocystites*, *Lebetodiscus*, *Reteocrinus*, and *Stenaster*. Among these, *Cleiocrinus* occurs in the Chazyan of Lake Champlain and of western Tennessee, and *Hybocrinus* occurs in the Chazyan of Montreal. *Edrioaster* ranges in the Trenton as far west as the Minnesota area, where it is listed by Ulrich from the Prosser member. *Porocrinus* occurs not only at Ottawa, Kirkfield, and Belleville in southern Ontario, but also in the Platteville member of the Black River formation in Illinois, and in the Trenton of Frobisher Bay, in Baffin Land, in Arctic America. *Hemicystites* occurs at Peterboro, but in Kentucky it is known only in the upper or Cynthiana member of the Trenton, above the Trenton of the Ottawa area.

Among the genera occurring not only at Ottawa, Kirkfield, and in central Kentucky, but also as far east of Ottawa as Montreal are *Cupulocrinus Dendrocrinus*, *Ectenocrinus*, *Hudsonaster*, *Pleurocystites*, and *Tæniaster*, the last mentioned genus occurring near the city of Quebec. *Archæocrinus* and *Cheirocrinus* are known from as far east as Montreal, but are not listed from Kentucky. Of these genera *Cupulocrinus*, *Dendrocrinus*, *Hudsonaster*, *Pleurocystites*, *Tæniaster*, and *Cheirocrinus* are known also in the Trenton of New York, while *Hudsonaster* ranges as far west as Minnesota.

Cyclocystoides is not known at Montreal, but occurs at Lake St. John, in northern Quebec, and the type of *Cyclocystoides anteceptus* Hall was obtained on the Escanaba River in the northern Peninsula of Michigan. The genus is known also from New York.

Among the genera known from Ottawa and Kirkfield, and also in New York, are *Carabocrinus*, *Cremacrinus*, and *Urasterella*. The first two of

these occur also in the Trenton of Kentucky, and the last ranges as far west as Minnesota.

From the preceding notes it is evident that during Trenton times the Ottawa echinoderm fauna ranged as far east as Montreal, as far west as Minnesota, and as far south as New York and central Kentucky.

In the Ottawa are, however, there are three echinoderm horizons. Of these the lowest horizon forms the lower third of the Hull member, about 35 feet above the base of the Trenton formation. The second horizon occurs 160 feet above the base of the Trenton, a short distance above the lower quarter of the *Prasopora* member, which is regarded as corresponding best to the typical Trenton of New York. The third zone occurs about 235 feet above the base of the Trenton, in the lower part of the Picton member. Of these three horizons the lower and middle ones are of special interest in this connection because they contain the largest and most varied of the echinoderm faunas.

The lower or Hull horizon is stated by Prof. Raymond (Bul. Mus. Comparative Zoology, vol. 56, No. 3, 1916, p. 260) to be well exposed at Kirkfield, and to be very near the horizon of the Curdsville member of the Trenton in central Kentucky. The exposures in eastern New York and at Montreal which contain *Pleurocystites*, and which belong to the Glens Falls member at the base of the Trenton, are regarded by him to be probably of about the same age as the Hull beds.

The middle or *Prasopora* horizon is that part of the Trenton best exposed at Trenton Falls, the type section of the Trenton in New York. It is characterized by the presence of *Clitambonites*.

The upper or Picton horizon is characterized by the presence of *Strophomena trilobita*, *Rafinesquina deltoidea*, and *Cyclospira bisulcata*, and, acccording to Prof. Raymond, probably is the horizon with which the Minnesota cystid bed, in the upper part of the Prosser formation, is to be correlated.

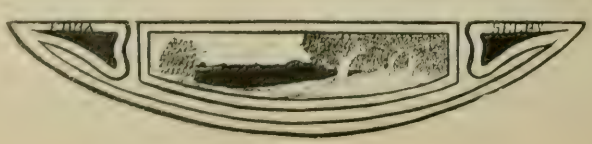
Apparently the Ottawa echinoderm fauna extended farthest south and east during the deposition of the lowest or Hull horizon. During the deposition of the middle or *Prasopora* horizon strata it apparently did not reach Montreal on the east, nor extend far beyond north-central New York in a southward direction. Possibly the exposures along the Escanaba River in northern Michigan belong here. During the deposition of the upper or Picton strata the Ottawa echinoderm fauna apparently reached the Minnesota area. Finally, during the deposition of the lower Maquoketa there appears to have been a reinvasion of the Ottawa Trenton echinoderm fauna from some unknown northern area to which it had retreated during the long period intervening between the close of the Trenton and the beginning of the Maquoketa.

During early Trenton times southern Ontario, including Ottawa and Kirkfield, appears to have been a center of distribution from which the Ottawa echinoderm fauna radiated in different directions.

Fore-runners of this fauna appear already in the Chazyan of southern Quebec, of the Lake Champlain area of New York, and in various parts of Tennessee. It remains to be determined from what areas this echinoderm fauna invaded southern Ontario in early Trenton times, but present information suggests at least that later, during the Trenton and subsequent to the Trenton, this fauna was largely of northern distribution.

A few of these genera are known also from European strata but these do not indicate the origin of the Ottawa echinoderm fauna from European sources. The presence of *Cheirocrinus* in Great Britain and in the northwestern part of the continent of Europe, including the Baltic provinces, is indicative rather of the northern distribution of this genus, since the Chazyan species found in America appear to be as old as anything found in Europe. In a similar manner, the occurrence of *Pleurocystites* in Ireland, Wales, and the Girvan district of Scotland, and the failure of its appearance on the continent, suggests the origin of the British species from American sources, rather than the reverse, the American species from the Ottawa area being regarded by Dr. Bather as distinctly older (Trans. Royal Soc Edinburgh, 49, pt. II, 1913, p. 460).

It is not unlikely that the greater part of the Ottawa echinoderm fauna is distinctly of American origin, though the data are not yet at hand to determine its sources. More detailed knowledge of American Chazyan echinoderm faunas is necessary to trace the origin of the Ottawa faunas one step backward.



WOOD RATS AND GRIZZLY BEARS

BY MERLE F. BANCROFT

MANY examples of the instinct in wild animals to shield their young from enemies may be seen in tramping through the mountains of southeastern British Columbia. The writer, accompanied by a prospector and an engineer, saw two such examples on the morning of July 29th, 1920. The first was on the part of a mother wood rat dwelling in an abandoned mine and the second was in the case of a huge grizzly bear, concerned about the safety of her offspring.

We, three men, had set out from Ferguson with the intention of making a wide circuit through part of the Selkirk Mountains lying between Lardeau Creek and the Duncan River. The first day we lunched at "Circle City," a one cabin stopping-place in the timbered valley of Ferguson Creek. The trail from Circle City to the Old Gold mine on the Duncan slope proved to be an excellent one for gaining elevation. There was considerable snow on the pass and the trail on the Duncan side lay across several wide gulches full of hard packed snow. The construction of this trail is unique, as it rises from near the pass to skirt around a deep rocky basin; for a mile the trail is nothing more than a rock shelf cut high up on a limestone bluff. As we ascended from the rock shelf, a mountain goat cantered ahead of us across some snow and was soon climbing to safety among the cliffs. Before reaching the Old Gold cabin, located on the crest of a short ridge, we paused to bag a whistler or marmot. We were successful in this. The hoary marmot goes well in a shepherd's pie and is one of the popular fresh meat diets of the Indians in British Columbia.

In the valley that lay to the north below us the wild animals were fortunate enough to know little of man and his doings. There were a number of gophers around the cabin to welcome us. Prospectors working at the Old Gold mine had made friends with these animals, called them by name and fed them scraps of food. In some respects these little creatures showed no more fear than gray squirrels that frequent parks and climb over people in search of food.

Later in the evening porcupine and wood rats furnished a different sort of diversion. Their nocturnal activities jeopardized the chances for our much-needed rest. Wood rats have a reputation for being troublesome at night and the most effective method of getting deadly revenge is to strike a light and deal suddenly with the pests. A very peculiar unpleasant odour is characteristic of the wood rat.

In the West the bushy-tailed wood rat is abundant and known by different names, such as "mountain rat," "trade rat," "pack rat," "bush rat" and other less modest terms descriptive of their habits and character. Probably no other animal has furnished better target practice for indoor shooting where interior decorations are given no serious thought and "dead rats" are the objective.

One night while sleeping under the stars far from any cabin I was aroused by my companion exclaiming, "Do you smell a wood rat?" The scent of the little beast was fresh and strong and in the half dark we began to feel around to locate our visitor. There were two thicknesses of blanket between us and the ground. Shrill squeaks and squeals came from a part of the blanket that lay between us as we grabbed a suspicious looking fold. The wood rat had chosen a good place to share in our bodily warmth, though that may not have been his intention. He had taken up a position in the blankets almost beneath my companion's nose.

On another occasion our temporary quarters were in an old mill on the South Thompson River not far from Ashcroft. Wood rats were nosiy throughout the night. I was sleeping on a camp cot and in the gray dawn heard a rapid beating on the board floor beneath my cot. Quickly ducking my head over the side of the cot, I got my first close-up glimpse of a wood-rat. He was sitting on his haunches and his long bushy tail lay flat on the floor. The noise had ceased, the rat had escaped and I could only guess how that noise had been made. Had the rat been slapping his tail on the floor? The tail looked too light to produce the noise I had heard. I later learned that wood rats "express annoyance or alarm by a rapid drumming on the ground with their hind feet, just as is done by some of the hares and rabbits." This particular wood rat had become adept in drumming on a board floor. The noise produced was far louder than ground drumming.

To return to the events of July 29th, 1920, we three men got an early start, descending from the Old Gold cabin into the mountain basin below. We stopped at the Guinea Gold mine to look over the underground mining developments on this property. There was every sign that wood rats had taken up their abode in the blacksmith shop and in tunnels. "They are prolific animals and each year have several litters containing from two to five." This mine had been infested by the

wood rats for some years, as indicated by the piles of sticks and trash. "Sometimes these piles of fragments seem to be made merely for amusement or to work off surplus energy, for they form useless gatherings of sticks and other materials, scattered aimlessly about the wood rats' haunts."

There are two tunnels on the Guinea Gold, connected by an eighty-five foot vertical upraise. Thirty feet below the upper tunnel an intermediate tunnel had been driven from the upraise. There was considerable water near the entrance of the lower tunnel and no wood rats enter water voluntarily. The popular point of access to the mine for wood rats was plainly by the upper tunnel. This tunnel was bone dry and the floor was almost covered with sticks, leaves and materials packed in by the wood rats. Daylight penetrated gloomily into the tunnel for some distance over old abandoned nests. Eighty-five feet in from the entrance of the tunnel the upraise from the lower tunnel came through and since it was reported that some silver-lead ore might be seen in the intermediate cross-cut, we cautiously descended to investigate.

The atmosphere in the mine was decidedly ratty and we had already had audible evidence that we had startled some of the rat tribe in coming through the upper tunnel. We were surprised to find additional wood rat accumulations and in the intermediate cross-cut we came across one well kept nest. It was built up on the floor of the tunnel and looked very much like a comfortable old hen's nest, but instead of eggs we found four or five handsome young rats, gray little fellows with fine fluffy soft fur, large ears and bright black eyes.

While we were admiring this litter, much to our surprise the intrepid mother rat came to the nest and in the full glare of the mine lamps settled herself in a comfortable position. It looked as if the young rats had just ordered their breakfast and she would not postpone it a minute on our account. But we were mistaken in her intentions for after a few minutes she rose from the nest with a furry burden clinging to her tits. Besides holding on with their teeth, the young rats had firm hold on the mother wood rat's bushy tail. Toe-holds, tail-holds, or possibly a combination of both secured them to her. The old rat made directly for the mine shaft, descending gracefully and proudly, "with her tail between her legs," into the inky darkness where there was nothing but the rough rock wall to cling to in the descent of fifty feet down to the lower tunnel.

It was a rare exhibition of strength, a novel means of transportation. We had seen a wood rat jitney and a rather startling confirmation of the fact that wood rats are skilful climbers. Wood rats must take to climbing as naturally as ducks to water, judging from the location selected in this mine for nesting and rearing their young.

The second example of mother courage was soon to follow, open to the light of day. We found the trail down Marsh-Adams (Porcupine) Creek below the mountain basin and crossed snow-slide ground bearing abundant vegetation at this time of the year. The trail was hard to follow for it was almost wiped out for considerable distances, where bears had been harvesting roots and gophers. The grizzly bear is quite a digger, displacing heavy bowlders in efforts to have a taste of fresh meat.

We were well down below timber line, crossing through patches of huckleberry bushes. The prospector called our attention to several tin cans riddled with holes, near the trail. He had on an earlier trip taken these tins down the trail with the intention of gathering some berries. They were old jam containers left with the tops pressed on hard. A grizzly had found the tins and punctured them badly with tooth holes. Half a dozen tins were scattered about in a crushed and flattened condition.

The grizzly is a powerful animal and intelligent enough to keep out of sight of man. If given due warning, he will gallop off up a rough mountain side with the speed of a race horse. His claws are not constructed for tree climbing, they lack the proper curvature, and for this reason the grizzly bear must remain on the ground, take to flight, or show battle. When discovered in an open space he will make for the timber.

The grizzly bear has the reputation of being a land owner and he is apt to show battle if intruders come into his domain unannounced. The striking power of his forepaws is terrible. A prospector out hunting grizzly with a partner in the Selkirk, was dodging around a big tree to get out of the way of one of these bears. The bear struck at him and the tree got most of the blow, yet the bear's large claws came around the tree with enough force to hit the man a stunning blow on the forehead. The bear's efforts were arrested at this point by a lucky shot from the partner's gun.

Man and the black bear can get up a tree away from immediate danger, if they are quick enough and if there happens to be a tree at hand. The black bear has been seen with young cubs dangling from her flanks, holding on by their claws as the mother charged through the forest in flight. Young grizzly bears would have no such holding on power. I have never heard of a grizzly bear carrying the young to safety.

Below where we had seen the mutilated jam tins, repeated snow slides had heaped snow high

in places along the valley bottom and much of it still remained in spite of summer heat. It was on one of these large snow patches that we spied the bear family as our trail brought us around the crest of a low ridge. Two yearling cubs not far away were boxing and tumbling around on the snow. We stopped to watch them for we were quite uncertain whether they were playing or quarrelling. We soon spied the mother bear, an immense animal stretched full length on the snow napping or taking a sun bath. The young bears rambled down on the snow and began to frisk around and over their mother. The old bear raised her head and assumed the attitude of a big dog reclining in an attentive position. It was plain that those young bears could grow a great deal more before they would be as big as their mother.

The bear family were two hundred yards from the trail and on the east side of Marsh-Adams Creek, while our point of observation was on the west side of the Creek. A boisterous stream ran between us and the bears. Yet I must admit we were a bit nervous, for it had not been long since the bears had crossed that stream. We had seen on the trail, fresh signs of bear and the scent of bear still clung to the bushes.

We were anxious to get a good picture of those bears and a little more anxious to know what would happen when they discovered us. There was no tree at hand, and it gave some measure of comfort to know that we were with a prospector who had tamed a few bears and his 30-30 Winchester might do some more taming should occasion arise.

The wind was in our favor, yet it was not long before the old bear became restless and began to sniff the air. It was certain that her nose was the principal locator, for she got up and walked towards us. The prospector assured us that the bear's eyesight was good only for close-up observation. The grizzly was soon satisfied that we were no friends of hers. She got up on her hind legs and would drop down and come a little nearer and then repeat her performance. At the nearest approach, all three bears were standing on their haunches, a cub on either side of the mother bear. The young bears were intently watching their mother as she diagnosed the air. It was plainly the business of the mother bear to sound the retreat or continue the advance.

They say a grizzly bear is powerful, deliberate and quick to act. We felt the truth of the first two qualities and were waiting to see what might follow to prove the third. The mother bear was very deliberate, standing there on her haunches, champing her teeth, her mouth wide open at times and a long tongue circling about her face. We did not know whether she was foaming with rage or just nervous or possibly licking her chops at prospects of battle. The creek made so much noise that it was impossible to say whether there was any snarling in connection with all this grimacing. I think it must have been a demonstration of pure ugliness for she suddenly turned and drove the cubs off up the snow in a very undignified and formidable manner, scarcely pausing at the edge of the timber. It looked as if the young cubs had expressed a wish to come over and see us, but it had not met with mother bear's approval.

I learned some weeks later that the very excellent and heavy camera packed by the engineer who was with us, had failed to put on record what would have been some rare pictures. Heavy, thunder-clouds were threatening and the most acceptable thing had happened in the retreat of the grizzlies. Hastening along the rocky trail, we arrived at Spencer in a drenched condition. We had been seeing live things that morning and had no thought of the discomforts of packing in the rain. There is only a small cabin at Spencer, so we made a camp fire and a cup of tea in the open. The sun was shining by the time we were ready to continue our journey.

NOTES ON THE WATER-BIRDS OF LAKE NEWELL, ALBERTA

BY J. A. MUNRO, OKANAGAN LANDING, B.C.

THE recent agricultural development in the dry belt of Alberta that has been fostered by the Canadian Pacific Railway Company has led to important changes in the bird-life of the district, particularly in the vicinity of Brooks. Following the planting of grain and fodder crops, gardens and shade trees in this district, came an influx of land-birds, attracted by the insect hordes which invariably attend agricultural activities in a new country. The increase of passerine birds that closely follows the settlement of prairie or woodland is a phenomenon familiar to every bird-student and that the Brooks region should attract and hold many species of land birds is not particularly notable. The novel feature in this instance is, that not only was there a conspicuous

increase of land-birds but there was an invasion of water birds as well. While the growth of rural districts is favourable to the increase of various species of land birds, the reclamation of marsh-land usually connected with such development entails the reduction of water-birds on a large scale. In this case there was a reversal of the usual process caused by the creation of an artificial lake to hold the Company's water supply.

This reservoir, known as Lake Newell, lies in a natural basin five miles south of Brooks; its area is approximately twelve thousand acres and its maximum depth twenty-seven feet. The water is taken from the Bow River near Bassano and reaches the reservoir through two main canals, one entering at the north end and one at the south. The surrounding land is non-irrigable and there are no farms near the lake. Apart from the spillways and the few concrete dams which link up the ridges forming its shore line, Lake Newell has not the appearance of an artificial lake. The littoral is barren and sandy without brush or tree growth and at the time of my visit (June 29th and 30th, 1921) the sparse growth of short grass was burnt crisp while the low *Artemisia* and the several species of cacti indicated the prevailing desert conditions.

At first glance this arid waste surrounding the lake seemed most unfavourable for the study of bird life, but close inspection showed that various modifications, not at first apparent, had taken place during the seven years of the lake's existence. *Potamogetons* and other water-weeds eaten by Ducks have drifted in through the canals and in the warm fresh water they have thrived and spread to all parts of the lake. Masses of these weeds that have been uprooted by storms frequently cause trouble by drifting against the mechanism of the headgates and interfering with their operation. Accompanying these water-plants have come their attendant insects and mollusca. Fish also have entered the lake through the same channel and several species are now well established. With this abundant food supply there naturally followed an invasion of water fowl. The attraction of the fresh water and the insect and plant food was so great that these water birds remained to breed in greater numbers each year. adapting themselves to the unfamiliar environment. I found that Ducks were nesting under an artemisia, or a Russian thistle, or in any slight cover available on the barren shores of the lake. A Blue-winged Teal built her nest on one of the trails by the lake where a shallow depression between the waggon ruts offered an inducement. The bird flushed from almost under the bonnet of the car as we jolted along the rough trail—probably she was familiar with this form of disturbance. The seven eggs appeared hard set, so let us hope her good luck held to the end.

Scattered over the lake are a number of small flat islands—hill summits before the lake was made. The majority of these are less than an acre in extent and have obtained full measure of benefit from the life-giving water. This is manifested by the luxuriant growth of thistles, mustard, lambs' quarters, and other imported weeds—a thick jungle of vegetation. Poplars and willows are also springing up and their growth should be phenomenal. On these islands, free from molestation by predatory animals, the greater proportion of water fowl have chosen to breed. I was familiar with Pelican colonies, with Gull and Tern colonies, but never before had I seen breeding colonies of Ducks. For on several islands Ducks' nests were so plentiful and so close together one had to walk carefully to avoid treading on the eggs. On one island of approximately one-third of an acre I counted thirty nests of the following species: White-winged Scoter, Scaup, Pintail, Gadwall, Mallard and Baldpate. All these nests contained the full complement of eggs and all showed indications of being well advanced in incubation. Several of the nests contained eggs of two species, an indication of the crowding on the island. A Gadwall's nest contained six Gadwall eggs, two Mallard eggs, one downy Gadwall and one downy Scaup. The Scaups have an unpleasant habit of fouling their nests when they are flushed and one wonders if this is done as a protection for their eggs and against what enemy. It was too late in the season to see breeding Canada Geese, but one old nest was found and I was informed that five or six pairs bred on the lake. One pair nest on each island in splendid isolation. I was told they will not tolerate any Ducks in their vicinity. If this be so it is fortunate that they are such early breeders. Waders were represented on this island by two pairs of Avocets, two pairs of Killdeer and one pair of Spotted Sandpipers.

Another of the islands visited contained a breeding colony of Common (?) Terns, estimated at two hundred pairs, three pairs of Avocets, and as many breeding Ducks as were found on the first island. From a distance the shore of this island appeared snowy white with Gulls, which on on closer inspection, proved to be Franklin's. As the boat drew near the island they rose in three sections, circled over the boat several times, and then flew to an adjacent island where they settled on the beach to rest as before. These birds were about twenty miles from their breeding ground, which is established in a marsh covering several sections, southeast of Lake Newell. They were all adults and their inactivity in the height of the

nesting season and at such a distance from their breeding ground would lead one to surmise that the sexes segregate after the eggs are laid and that the males take no part in the subsequent domestic duties.

The Terns, which were hardly distinguishable amongst the great wheeling flocks of Gulls, remained circling over the island after the latter had departed. Their rather well-built nests of grass, the majority of which contained two or three eggs each, were found everywhere on the island, hidden in the thick woods. They showed a wide variation of color and markings, ranging from a pale greyish-green, lightly spotted with black, to a rich olive, blotched with sepia. A few nests contained downy young and several youngsters beginning to feather out were seen hiding in the woods. Avocets were also breeding here and the downy young, preposterous balls of fluff on attenuated legs, scampered over the sand and into the water where they rode as buoyantly as corks. At one time I held the downy young of Scaup, Tern and Avocet in my hand where the tiny olive, grey, and fawn morsels relaxed contentedly as if glad of the warmth.

Lake Newell is of particular interest at the present time owing to the recent proposal that it be created a Bird Sanctuary under *The Migratory Birds Convention Act*. This project has the sympathy of many of the residents of that district and the foregoing notes are submitted as evidence that there will be no lack of tenants for the proposed refuge.

THE HUNGARIAN OR EUROPEAN GREY PARTRIDGE

BY F. BRADSHAW, CHIEF GAME GUARDIAN, REGINA, SASK.

CONSIDERABLE interest has been aroused among sportsmen by the appearance of the Hungarian or European Grey Partridge at many points in southwestern Saskatchewan, and those whose love of birds is due more to an appreciation of their economic and æsthetic values, than to their sporting possibilities, are equally delighted to know of this new addition to the fauna of the province.

The occurrence of a new species of bird or animal is also a matter of scientific importance, therefore it might not be out of place to record a few facts concerning the history of this new arrival.

The source of supply was undoubtedly in the province of Alberta, and I am indebted to Mr. Austin de B. Winter, of Calgary, Alberta, for the following interesting account of the introduction of the Hungarian Partidge into that province. Mr. de B. Winter states that:

"In about the year 1906 or 1907, three of us imported a few quail (Bob White) from Kansas which, however, arrived in extreme temperature towards the end of February, I think, and which, owing to being confined in heated cars in transit, contracted pneumonia or some disease to which they very shortly succumbed after they were liberated.

The following year we renewed our efforts and secured funds from other sportsmen, resulting in our importing about fifteen pair that spring, and about a similar number of Hungarian Partirdge that fall. These were liberated about ten or twelve miles south of Calgary. Later importations were made, and to the best of my recollection, the total number of partridge liberated did not much exceed 150 birds, if indeed it reached that number, and these continued to multiply and spread all over the province.

"After 1914, I think, an open season with a bag limit of 25 birds was established, and a full month's open season, and sometimes two, has since been maintained, the present season's bag limit being 50 birds. These birds have increased unbelievably, and have literally spread all over the province. My impression is that they have practically all radiated from the point at which they were originally liberated.

"It is true that small quantities of five pairs or so were liberated at distances, say 100 miles north and about 60 miles south. I am informed that they are to be found in districts around Edmonton and North of Edmonton towards the Peace River (which I can hardly credit), and it is known that they have spread as far south as the international boundary.

"I have seen these birds at distances of 150 miles North and West of Calgary.

"So much at any rate for their spreading propensities, and you will observe that the birds have spread into new districts, notwithstanding the fact that in the new districts to which they have spread there has been an open season, and apparently no particular effort made by people to preserve them.

"The bird likes the stubble and seems to thrive well in prairie country. It is not a brush bird, although, naturally, cover affords protection from vermin. The bird is wonderfully prolific and

broods of twenty are frequently to be seen. Should casualty overtake the female, the male will bring up the family.

"The birds are extremely hardy, are of economic value, and seem to relish not only insects, but a great many of the weed seeds, such as wild buckwheat, etc.

"Our birds were imported direct from Hungary by Wenz and MacKensen of Yardley, Pennsylvania. The business is now operated by Mr. Wm. J. MacKensen, who, by the way, is a Canadian.

"I have had repeated enquiries from various parts of Canada, and from numerous clubs who wish to secure these birds. During the war, of course, it was impossible to obtain any, and while I have renewed efforts since, Mr MacKenzen informed me that he thought it would be some time before he could renew the importation of the birds, as the prices were prohibitive."

As a general principle, the introduction of foreign birds or animals is a very dangerous proceeding, for, although the introduced species may thrive, it may also become detrimental to the welfare of the native and more desirable species of animal life, and the benefits derived may not compensate for the losses sustained. For proof of this, we might cite the introduction of the rabbit into Australia, and the liberation of the House Sparrow on this continent, both of which, in their new environments, have become pests of the worst kind. With the view to finding out what effect the introduction of the Hungarian Partridge had had on the native game birds of Alberta, I referred this matter to Mr. de B. Winter, who, I am pleased to say, anticipates no serious developments along this line, as may be seen by his reply, which, in part, is as follows:

"I am glad you mentioned this phase of the subject, because I should have added that these birds are not antagonistic to our native birds in any way whatever, and knowing what I do of them in European countries, I did not expect they would be. Pheasants on the other hand, as you know, do interfere with partridges, often laying their eggs in partridges' nests."

So much for Alberta's contribution to the establishment of this bird east of the Rockies. We will now return to the facts that relate to Saskatchewan. The first intimation received by the Department of what was undoubtedly the Hungarian Partridge, was from Mr. Geo. H. Coulter, of Piapot, Sask., who, under date of November 23rd, 1921, wrote as follows:

"Have seen some small birds around here this fall, thought they were quail. Have been told they are Hungarian Partridge from Alberta. Have a close season put on them, so they will get a chance to multiply. They flush together and run on the ground, so will need protection."

About the same time we were advised by Professor J. S. Dexter, that a specimen of the Hungarian Partridge had been sent to the Saskatchewan University for identification by Mr. Russell Martin, of Rutland, which point is located in township 41, range 25, west of the 3rd meridian, about 20 miles east of the Alberta boundary. Mr. Martin writes that he "Saw a flock of 15 or 20 of these birds at the edge of a wheat field, about the first of September, and about the first of November, picked one up from beside the road three miles from where he saw the flock. It had apparently been killed by flying against a telephone wire. This is a hilly rough country, with considerable brush and sloughs and pot holes. About half the land is farmed."

Our first introduction to this bird in the flesh was through the kindness of Mr. C. H. Martin of Wilkie, and the manner in which the two birds submitted by him were obtained is worthy of note. They were hit by a passenger train just west of Wilkie, on the evening of January 5th, 1922, and were found on the front of the engine on the arrival of the train at the station. It is reported there was quite a flock of these birds, but no information as to the approximate number is given. Both these specimens are now on exhibit in the Natural History Museum at Regina.

Many other reports in substantiation of the advent of this bird have been received. Mr. D. J. Huntley, Saskatchewan Landing, writes: "While riding in the river brakes this fall, I startled a pair of birds identical to the partridge found in England. Is this the Hungarian Partridge?"

We are also advised by Mr. F. Doiton, of Valor, that a covey of eight birds were seen south of Twelve Mile Lake, township 5, range 2, west of the 3rd meridian, about 200 miles east of the Alberta boundary, and that other birds have been seen in that locality, and Mr. C. A. Millie, of Piapot, informs us that he saw a covey of Hungarian Partridges about ten miles southwest of his town.

With such a pleasing nucleus of birds for breeding purposes, at widely separated points in the southwestern portion of the province, there seems every likelihood of the Hungarian Partridge becoming well established, and with the object of affording the protection necessary to enable it to increase by natural process, The Game Act has been amended, making it unlawful to shoot these birds at any time.

The co-operation of all persons interested in the welfare of this new game bird is respectfully solicited, and the Department will be interested to hear from any other persons who observe this bird for the first time.

INJUDICIOUS FOSSIL COLLECTING

BY E. J. WHITTAKER

A CERTAIN wise man called Pope many years ago declared that "a little knowledge is a dangerous thing." With prophetic vision he looked forward into the twentieth century when the general public would be treated to many and varied forms of "little knowledge." One of the most interesting developments in this regard is the almost universal instruction in elementary natural history. Boys and girls become scouts and guides and sally forth to delve into or rather to uproot the secrets of nature. With the natural mpetuosity of youth this process often gives results other than those expected and leads us to conclude that a genuine love of nature, which protects rather than destroys, is still dormant. We have lately had frequent examples of this tendency. In certain parts of New York state, the girl guides have been so impressed by the beauty of the trailing arbutus, encountered in their natural history excursions, that it has now ceased to exist. Why? It has been transplanted to the city homes of the guides where it did not stand a chance of surviving. In another part of the same state a group of boy scouts, by industrious application of the knowledge imparted in a woodcraft and trapping course, have almost exterminated the fauna of that area. Bird life is being saved, not by the "little knowledge" of the elementary courses in schools, but by further intensive instruction, propaganda, and drastic laws. The writer wishes to enter a plea on behalf of a class of objects which cannot defend themselves, whose destruction cannot be repaired, and which can suffer extremely under the hands of an inexperienced amateur collector, to wit, fossils.

Fossil collecting is an interesting and instructive pursuit and our knowledge of the distribution of fossils has been increased quite as much by the many collectors throughout the country as by the professional palæontologists. For the amateur collector the article by Dr. E. M. Kindle, of the Canadian Geological Survey, is very useful.* In it is expressed the fact that haste is taboo and hard work and patience are essential. This rule does not appeal to many amateurs who still fail to realize the importance of a fossil, with the result that many of these remains are ruined by careless and hurried attempts to extract them from the matrix. A good example of this vandalism was observed a short time ago in Hull.

The Hull limestone quarries have been famous for many years on account of the abundance and preservation of their fossil remains. Of these the crinoids and cystids are most valuable on account of their beauty, perfect preservation and rarity. The fine collections of the late Elkaniah and Walter Billings represent many years of enthusiastic search for these forms in this locality. While looking over these beds the writer came upon a heavy bed of hard limestone about ten feet square whose surface was covered with crinoids. Someone who had realized their value had endeavoured to remove them and had succeeded only in ruining them all and leaving their mangled remains to sadden the eyes of those who followed. The only method of removing these specimens was to channel carefully with a chisel to a depth of at least half an inch all around the individual fossil and then the whole could be removed easily. But this might require half an hour to obtain one specimen and the individual who had desecrated this plot could not afford to spend so much time and energy in getting one perfect specimen which would have been a source of pleasure to him for all time to come. For the fossil has this advantage, it neither fades nor decays after being gathered. This example at the Hull quarries is mentioned because of local interest, but the writer has observed similar ravages elsewhere. So he wishes to incorporate an unofficial "Society for the Protection of Fossils" without officers or fees, but to whose tenets all who are interested in and realize the importance of these ancient remains should subscribe. Besides the manual of instructions cited above the following rules of ethics should govern its members:

1. Do not endeavour to extract an important or rare fossil without adequate tools and a proper conception of the procedure to be followed. It is better to leave it for the time, even to another collector, than to destroy it.

2. The preservation of the fossil is the main object sought. It pays to take a little more time to get the specimen out complete.

3. Where specimens are scarce do not remove every individual of each species which can be seen at a given locality, thus emulating the "game hog" in hunting. At a later date, to back up or confirm previous data, it is advisable to be able to relocate readily such forms.

Observance of the above rules of conduct, which

*KINDLE, E. M., Fossil Collecting, *Ottawa Naturalist*, Vol. XXIX, No. 10, Jan. 1916.

will be prejudicial to no one, will result in a greater feeling of satisfaction on the part of the amateur collector, and will certainly obviate unkind thoughts such as those that passed through the writer's mind on viewing the shattered crinoids in the Hull quarry.

PROSECUTIONS

Migratory Birds Convention Act by Officers of the Dominion Parks Branch and Royal Canadian Mounted Police.

REPORTED DURING THE PERIOD—FEBRUARY 15, 1922—MAY 4, 1922.

Horton Quindley, Stony Island, Shelburne Co., Nova Scotia. Shooting a Guillemot. Case dismissed.

Horton Quindley, Stony Island, Shelburne Co., Nova Scotia. Having in possession a Guillemot. Fine $10.00 and costs.

Albert E. Petty, Thessalon, Ontario. Killing a Pileated Woodpecker. Fine $10.00 and costs.

Clifton Woodard, North Hatley, P.Q. Having in possession a Wild Duck. Fine $10.00 and costs.

Robie Wagner, Central Port Mouton, Queens Co., Nova Scotia. Attempting to kill a Horned Grebe. Fine $10.00 and costs.

Ralph Amy, Ayer's Cliff, P.Q. Possessing a Bittern. Case dismissed.

John F. McKinnon, Glace Bay, C.B. Having in possession a Canada Goose in close season. Fine $10.00 and costs.

Thomas Dustin, R.R. No. 2, Ayer's Cliff, P.Q. Possessing a Pileated Woodpecker. Fine $10.00 and costs.

Michell Bowers, Digby, Nova Scotia. Attempting to shoot an American Golden-eye in close season. Seizure—One shot gun. Fine $10.00 and costs (suspended).

James Currie, Charlottetown, Prince Edward Island. Hunting a Canada Goose in close season. Fine $25.00 and costs.

Charles W. Patterson, Charlottetown, Prince Edward Island. Hunting a Canada Goose in close season. Fine $25.00 and costs.

John M. Roop, Charlottetown, Prince Edward Island. Hunting a Canada Goose in close season. Fine $25.00 and costs.

Vernon Gay, Charlottetown, Prince Edward Island. Hunting a Canada Goose in close season. Fine $25.00 and costs.

Gordon Worth, Charlottetown, Prince Edward Island. Hunting a Canada Goose in close season Fine $25.00 and costs.

NOTES ON BIRDS IN SOUTHWESTERN SASKATCHEWAN

BY L. B. POTTER

THE valley of the Frenchman River is about the northern limit of the Sage Grouse in southwestern Saskatchewan. At this point, 5 miles above Eastend, the bird was never very numerous, and we seldom saw a band exceeding 8 or 10 in number. The Sage Grouse becomes very tame if left alone and some years ago we were troubled with the young birds trespassing in our garden, where they would eat the hearts out of the lettuce plants. Scaring them off had little effect, but we managed to supply ourselves as well as the Sage Chickens with lettuce in the end. On another occasion I have seen a couple of youngsters enjoying a dust bath within 20 yards of the stable door. But the coming of the railway up the valley changed all this and between 1914 and 1920 hardly a bird did we see. However, on the wide flats below Eastend and all the way to the international boundary, I believe there have always been fair numbers, and during the past winter we have been glad to see a little band of 8 or 9 generally on our own land; and we hope they may decide to remain here to breed. There were two "dancing-grounds" within a mile of this house and quite frequently I used to steal up close and watch the proceedings. The Sage Grouse at ordinary times is very inconspicuous, harmonising well with the sage-brush in which, for the most part, it feeds, but the white air-sacs of the male birds at the pairing season can be seen a mile away; and the sight of these white objects moving about certainly puzzled me at first, for without field-glasses the rest of the bird is quite invisible so far away.

During the winter of 1921-22 several Rosy Finches (*Leucosticte tephrocotis*) appeared in the valley. A bird of the Rocky Mountains in summer, during the winter months it wanders

over the prairies as far even as Manitoba. We collected a few specimens, which are now in the Provincial Museum at Regina. I first noted the bird in November, 1912; probably it visits this locality in more or less numbers every winter. Excepting once, I have seen them only in and around our corrals and stackyard where they feed on weed seeds like other finches. During the winter of 1916-17, I saw or heard of several and while sitting in the train noticed a couple feeding with some House Sparrows at the foot of a grain elevator in Eastend. It is a silent bird and its only note is a soft "que, que" when distrubed. All the birds we saw were apparently *tephrocotis*.

For the first time in my experience a Crow tried to winter here, being seen on February 5th, and 6th. After that the weather turned very stormy and cold and we saw it no more.

The Horned Lark is now a resident throughout the year, though it may be that quite a number of our little winter birds are from the far north. They are certainly much lighter on the under parts.

NOTES AND OBSERVATIONS

Subscriptions for 1922 are now due; by paying promptly you will greatly facilitate the publishing of this magazine.

SKIN IRRITATION DUE TO PLANT POISONING.—Having been a victim at times to poison ivy, Mr. Gussow's paper on the subject was of considerable interest to me. If he has found an active cure to the complaint he has conferred a benefit on all out-door enthusiasts. I can testify that some people are more or less immune to its effects. As a child and a youth, I handled the plant fearlessly. Our place at Muskoka was over-run with poison ivy and it was only through my mother and I pulling it up by the roots (with bare hands as we would any other weed) year after year that it was eradicated. This was largely done in warm summer weather when perspiration was profuse. We crushed it into large baskets and carried it to the fire-place where we had almost nightly camp-fires. Neither of us showed any signs of poisoning though all the conditions seemed most favourable for it. Our immunity was undoubtedly constitutional.

Years after, again in Muskoka, my mother, not fearing the plant, attempted to clear a neighbor's place of it after the old method, and came down with a perfectly terrible case of ivy poisoning, whereby she was confined to bed for a week or more. Similarly I have since found that I could no longer expose myself with safety to the plant. Whilst not peculiarly susceptible, I have had several attacks on much slighter provocation than I used to offer to the plant in the old days. It is evident that whilst there are various degrees of partial as well as complete constitutional immunity towards ivy poisoning, the protection may be lost at any time. I do not doubt that various physical and physiological conditions affect susceptibility, but one would naturally expect that when the pores of the skin are being thoroughly flushed outward by profuse perspiration, it would be one of the poorest times for external poisons to be transfused inward.

During comparatively moderate attacks on the hands, especially in the soft skin between the fingers, I found that a thorough washing with coarse laundry soap gave more relief than anything else. Fine toilet soap, however, was almost useless. I took the strongest and harshest laundry soap and worked up a good lather on the hands, continuing the washing motion (which, under the circumstances is far from a disagreeable proceeding) until the lather vanished and the hands were practically dry. This may not cure, but it certainly gives relief from the intense irritation for from half an hour to an hour, when it may be repeated. The virtue in the treatment lies in the large amount of free alkali in the soap and the massaging, the soapy principle assisting the latter and preventing friction. The soap drying on the afflicted parts may also hold the alkali in place longer than an ordinary wash would remain. This is an easy remedy, always available, and is good at least for light cases.

It may also be noted that Poison Ivy, *Rhus toxocodendron*, is not the only plant that may cause these irritations. Poison Sumach (Poison Oak) *Rhus vernix*, is equally bad. One of our common green house Primulas is also a source of danger to many people, as well as that most beautiful orchid, the Showy Lady's Slipper, *Cypripedium hirsutum*. Whether the above treatment is equally effective with poisons from all these plants I cannot say.—P. A. TAVERNER.

EUPHYLLOPOD CRUSTACEANS FROM CANADA AND ALASKA.—A few additions and corrections to my article about this subject in this publication, May, 1921 (Vol. XXXV, No. 5), may be of interest:—

During a stay in London recently (January, 1922) I have assured myself that the specimens ("types") of Conchostraca from Canada mention-

ed by Baird are still in the British Museum of Natural History and preserved in pillboxes dry.

Those of *Limnetis gouldii* comprise three full-grown (3½ by 4 mm.) specimens from St. Ann's, P.Q.; and in the museum is also a vial with two other specimens of the same species, collected in fresh water at Montreal by Prof. Jukes and presented in 1890 to the British Museum by Prof. Rupert Jones.

When I was in Christiania, Norway, November last, Prof. G. O. Sars there told me that he felt sure that Baird's species, *L. gouldii*, is the same as the well known North European species, *L. brachyurus*. He has now received specimens of *L. gouldii* from Ottawa, so as to decide this point by rearing and comparison of the two species.

Baird's "type"-specimen of *Estheria caldwelli* is a dried shell, 8 by 5 mm. in size. There is no information about when it was collected in Lake Winnipeg.

Though examining all the arctic Euphyllopoda in Scandinavian museums (besides in London) I have been unable to find any definite records of *Lepidurus arcticus* from Labrador or of *Branchinecta paludosa* from Spitsbergen.

The following corrections should be made in the same number of the "Naturalist":—

P. 92 (under Muller, O.F.) Omit the word Prodromus, and read *1788* instead of 1777. On p. 100 read *Camden* Bay, instead of Canadian Bay.

P. 93: Sahlberg's paper was published in Helsingfors, 1875.

P. 94: Under Brehm, read Vol. 45, instead of Vol. 34.

To the bibliography on pp. 92-94, add the following works:—

Herbst, J. F. W.—Versuch ein. Naturgesch. der Krabben und Krebse, etc., Vol. II, Berlin und Stralsund, 1790-1804.

Dybowski, B.—Beitr. zur Phyllopodenfauna der Umgegend Berlins, etc. (Arch, fur Naturgesch., 26 Jahrg., Berlin, 1860.)

Wierzejski, A.—Geographical distribution, etc. of *Branchinecta paludosa*, O.F. Muell. (in Polish) Cracow, 1882 (1883).

Lilljeborg, W. *Limnadia gigas* (J.F.H.) forekomm. i Sverige (Ofvers. Kgl. Bet. Akad. Forh. for 1871, Stockholm, 1872.)

Lilljeborg W. Synopsis Crust. Suec. Ordin. Branchiopod. et Subord. Phyllopod. (Nova Acta Reg. Soc. Scient. Upsal., 1877.)

Lilljeborg, W. Beitr. z. Fauna der Baeren Insel, 3, Entomostraceen (Bih. t. Kgl. Vet. Akad. Handl., Bd. 26, Afd, IV, Stockholm, 1900.)

Guerne, J. de, et Richard, J: Sur la faune des eaux douces du Groenland (Compt. Rendus hebdom. des seances de l'acad. des sciences, Tome 108, Paris 1889.)

Sars, G. O.—Bemaerkn. om de til Norges Fauna hoer. Phyllopoder (Forh. Vid. Selsk. for 1873, Christiania, 1874.)

Sars, G. O.—Crustacea Norske Nordeksped. 1876-78, (Vol. VI, Christiania, 1885-86.)

Richard, J.—Entomostr. recueill. par M. Ch. Rabot a Jan Mayen et Spitsbergen (Bull. de la Soc. Zool. de France, Vol. 22, Paris, 1897.)

Richard, J.—Sur la faune des eaux douces explorees en 1898 pendant la campagne du yacht "Princess Alice" (Mem. de la Soc. Zool. de France. Vol. II. Paris, 1898.)

Linko, A.—Beitr. z. Kenntn. der Phyllopodenfauna des europaeisch. Russlands (Trav. de la Soc. Imper. des Naturalistes de St. Petersbourg, Vol. 31, 4, 1901; in Russian.)

Zykoff, W.—Zur Crustaceenfauna der Inse Kolguljev (Zool. Anzeig., Bd. 28, 1905.)

Juday, C. and Muttowski, R. A.—Entomostraca from St. Paul Island, Alaska (Bull. Wisc. Nat. Hist. Soc., Vol. XIII (new series), 1915.)

Dahl, K.—Studier eg Forsoeg over Oerret og Oerretvand, Christiania, 1917 (tables).

Lundblad, O.—*Branchinecta paludosa* and *Polyartemia forcipata* in Haerjedalen; some new localities for *P. forcipata* and *B. paludosa* in Sweden (Entom. Tidsskr., Stockholm, 1914-15).

Lundblad, O.—Vergl. Stud. ueb. die Nahrungsaufnahme einig. schwed. Phyllopoden, etc., (Arkiv f. Zoologi, Bd. 13, Stockholm, 1920).

Olofssen, O.—Suesswasser-Entomostracen, etc. von Murmankueste, etc. (Zool. Bidr. fr. Univ. Uppsala, Vol. 5, 1916-17).

Haberbosch, P.—Die Suesswasser entomostraken Groenlands (Zeitschr. f. Hydrologie, Jahrg. 1, 1920).—FRITS JOHANSEN.

THE STARLING IN MAGOG.—On Saturday, the 11th of March, 1922, a Starling (*Sturnus vulgaris*) put in its appearance in Magog.

I came across the bird suddenly on leaving my office at 1.15 p.m. It was feeding, in the middle of Main Street, with some English sparrows, who, with their customary cheek and curiosity were keeping a close watch over the new-comer.

The Starling had nothing to fear, however, as it is a much larger bird, being 8½ inches in length, and its first concern seemed to be its appetite; it had evidently just arrived and was, naturally, hungry. It later proved to be a male bird. While I was observing, he perched for a few moments on a tree and then resumed his feeding on the ground, working along the roadway to the Dominion Textile Company's Stables, which subsequently became a kind of food-emporium for him as it is for a certain band of sparrows. I was unable to follow up my new acquaintance until Monday, March 13th, when I found him at his

same quarters, with the same bodyguard of sparrows. When not working—i.e., between meals—he would sit quietly on a slanting, low roof and preen his beautiful feathers.

The bird reminds one forcibly of the Meadowlark (*Sturnella magna*) especially by the shape of its head and the long beak and short, square tail, the two last features being even more accentuated than in the Meadowlark. A resemblance is implied in the generic names of the two species, viz. '*Sturnus*' and '*Sturnella*,' although they belong to two different families, the Sturnidae and Icteridae. The plumage of the Starling is glossy black with metallic reflections of green, blue, purple and even lavender colors, according to the way the light strikes the feathers. Most of the feathers are tipped with buffy spots, giving the bird a spangled appearance. The elongated, spear-like bill is mainly yellow and the sturdy legs, which "run" and do not "hop", are brown red, almost an Indian red.

The Starling is a native of Western and Central Europe, migrating in winter to Southern Europe and Northern Africa. It is one of the commonest and best known birds in England, where it is met with in swarms following cattle and sheep, alighting on their backs to feed on the ticks which infest them. It feeds on the ground, eating cut-worms, grasshoppers, grain, etc., and it also perches in trees and shrubs, including fruit and berries in its diet.

The birds were introduced into this country over 30 years ago; 60 individuals in 1890 and forty more in 1891 were liberated in Central Park, New York City, from which vicinity these birds and their progeny have gradually radiated around the country for several hundred miles and can now be reckoned in the millions.

The Magog bird probably came up the Connecticut River Valley.

The Starling is a hardy and tenacious bird, and with the English Sparrow (another importation) tends to keep away other more beneficial insectivorous species. Like the Sparrow, too, it will probably become a nuisance and a pest unless its increase is artificially checked.

I collected the Magog bird on the 13th instant and found on dissection that it was a male and apparently a non-breeder. The present record would indicate that the migratory instinct is asserting itself and that the species can now be considered as fully naturalised. We may confidently expect more of these birds from now on. —F. NAFIER SMITH, Magog, Que.

NOT A PLESIOSAUR.—The newspapers of late have had a great deal to say about the strange animal which has been seen in Patagonia, and in nearly every case it is spoken of as a plesiosaur. What the strange animal will prove to be, the writer would not attempt to guess, but a few remarks about plesiosaurs will show that there is little chance of Prof. Onelli capturing a live plesiosaur.

The plesiosaur lived from Triassic to Cretaceous times, but not a bone of any genus of the order has been found in rocks of more recent age than Cretaceous. This means that plesiosaur has been extinct for more than three million years. The Patagonian monster is reported as being very huge, so heavily armoured that a bullet could not penetrate to the vital organs, and as having made a great path through the forest. Some plesiosaurs were very large, though many were of moderate length, some being less than ten feet long, and none were covered with a bony dermal armour. The fore and hind limbs both constituted flippers or paddles similar to those of a whale and were not adapted for walking but were purely swimming organs. Most genera of the order Plesiosauria had long snake-like necks and small heads with sharp conical teeth suitable for catching living fish, which were probably their main diet Smooth pebbles, which it is thought were used to aid digestion, have been found in the stomach. The paddles were the main means of propulsion, the short tail probably serving as a rudder.—C. M. STERNBERG.

DOVEKIES AND MURRES PICKED UP DEAD AND DYING.—The past winter appears to have been a hard one for various species of our more northern water birds. About the middle of December, 1921, Dovekies were reported from different sections in Kings and Annapolis Counties, Nova Scotia. Always were the stories the same—birds picked up unable to rise and very much emaciated. Many of these were picked up miles from salt water and all attempts to induce the weakened birds to eat were fruitless. Reference to my records shows that between December 11th and January 19th, there were thirty-seven individuals reported to me, nine of which were brought or sent by mail, in the flesh. In addition to the above, a report from Digby Basin reads as follows: " . . . at Bear Island the remains of several Dovekies were discovered where they had been devoured by Crows." Of the nine which I had an opportunity to examine, all were in a similar starved condition, five being dead when received and the other four surviving only a few hours. The internal organs were so dried up and wasted that I was unable to sex any of the specimens handled.

On December 19th, five were brought to school by children at Truro who had picked them up at

different points by the wayside after leaving home. These were all alive and had apparently fallen during the night, possibly attracted by the lights of the town over which they flew bewildered until exhausted. Eight others were reported from the vicinity of Truro about the same time. Between the 23rd and 28th of December, there were seven found about the town of Annapolis Royal.

Five Murres were reported from January 30th to February 18th, all of which were alive at the time they were discovered. Four of these were sent to me and on examination proved to be Brunnich's Murres. Two were taken under conditions which seem noteworthy: On January 30th a neighbour was driving across the dyke at Port Williams when his attention was attracted to a bird which was flying towards him swiftly. It was about to pass in front of him when it struck the telephone wire with a crash which sent it spinning to earth with a badly fractured skull. It lived only a few moments. When it was handed to me it was still warm. It proved to be a female Brunnich's Murre and was a very large one, measuring exactly 20 inches from tip of bill to end of tail. The other measurements were as follows: Wing, 8 in.; Tar., 1.50 in.; Bill, 1.25; width bill at nostril, .48 in. Another was discovered on the 10th of February, standing erect in the snow holding two cats at bay. These would attempt to strike the bird with their claws and one had succeeded in giving the Murre a severe cut on the throat, though only skin deep. The bird, with the use of its bill and powerful thrusts, was able to look out for himself remarkably well.

Mr. Forbush of Boston reports that Dovekies, Brunnich's Murres, and Razor-billed Auks have been common all along the New England seaboard and by way of explanation states that evidently some disturbance has occurred in the north and there "must have been some tremendous storms at sea."—R. W. TUFTS, Wolfville, N.S.

COWBIRD IN NOVA SCOTIA.—On the 17th of April, 1922, I had the pleasure of meeting with a Cowbird for the first time in my field experience in Nova Scotia.

This was at Kingston Station, Kings County, where the bird was feeding on the ground by the roadside. At the approach of the car it flew to the nearest apple tree, some 25 feet distant, and sat there wiping its bill in a manner which showed slight concern for the car, which was brought to an abrupt stop. The bird was a male and in very fine plumage. This appears to be the first record from this part of the Province, though several Cowbirds have been reported from Yarmouth County.—R. W. TUFTS, Wolfville, N.S.

EARLY NESTING OF THE AMERICAN GOSHAWK.—In the cases of ten nests of this species which it has been my good fortune to examine during the past 15 years, or so, it has been possible to determine that the eggs were laid about the 1st to the 10th of May. On the 16th of April this year I collected a set of 3 Goshawk's eggs which were slightly incubated. This nest was examined on the 6th of April, and on that date held two eggs. The nest was in a medium-sized beech tree, about 35 feet up, and well fastened in the first crotch. An attempt was made to photograph the bird at the nest and a blind was constructed for that purpose. She returned within about 50 yards several times, but apparently her keen eye detected the changed landscape even at that distance and she quickly disappeared. The male bird was not in evidence and the female, an adult, was very wary, leaving the nest when we had approached within about 45 yards. She flew about for some time, uttering harsh cries, then disappeared, returning after a considerable lapse of time when she supposed we had left the woods.

These birds are remarkably uniform in their choice of building sites, seeming to prefer a low crotch in a medium-sized hard-wood tree and never (in my experience) more than 40 feet from the ground.—R. W. TUFTS, Wolfville, N.S.

NOTES ON SOME WINTER BIRDS OF THE GASPE PENINSULA.—In the early winter of 1921-22, I made a brief journey through the Gaspé Peninsula to Gaspé, Cap des Rosiers, Percé, and Bonaventure Island. I started from Matapedia, P.Q., on December 7 and returned there on December 12. On this journey I had, for the most part, little opportunity of observing birds except from the windows of trains or from sleighs, and therefore failed to identify many of the birds that were glimpsed. The following notes will, however, show something of the character of the avifauna of the region at that season.

Cepphus grylle. BLACK GUILLEMOT.—About a dozen individuals of this species were seen swimming and diving just outside of the surf at Cap des Rosiers on December 9. In the waters near Bonaventure Island three of them were seen on December 10 and three on December 11.

Larus hyperboreus, GLAUCOUS GULL.—An adult specimen of this species, which appeared to be accustomed to the proximity of human beings, was studied at close range as it stood on the beach at Cap des Rosiers village on December 9. No other Gulls seen during the journey were posi-

tively identified, but, with one exception, all of the Gulls seen during this period which were near enough to be distinguished well were of the white-winged species. The exception was a bird, seen from the train near Gascons on December 8, which was thought to be an immature Great Black-backed Gull (*Larus marinus*). The number of Gulls which I saw during the short time which I spent in the Gaspé Peninsula averaged about half a dozen each day.

Harelda hyemalis. OLD-SQUAW.—Forty seen at Bonaventure Island on December 10 and twenty-three at the same place the following day.

Somateria (sp. ?). EIDER.—Three seen off Cap des Rosiers on December 9 and about one hundred twenty-five in one flock at Bonaventure Island on December 11. Two of those at Cap des Rosiers and about twelve of those at Bonaventure Island were adult drakes.

Corvus brachyrhynchos brachyrhynchos. CROW.—Several seen from the train between New Carlisle and Gaspé on December 8. Two seen at Percé on December 10 and two at New Carlisle on December 12. I was informed that a few Crows sometimes pass the entire winter on the coast near Gaspé.

Pinicola enucleator leucura. PINE GROSBEAK.—A solitary individual seen on Bonaventure Island on December 11.

Lanius borealis. NORTHERN SHRIKE.—One seen on Bonaventure Island on December 10.

Planesticus migratorius migratorius. ROBIN.—One seen seeking food in a field blown bare of snow on Bonaventure Island on December 10 and 11.—HARRISON F. LEWIS.

BIRD NOTES FROM ST. THOMAS, ONTARIO.—During the exceptionally dry summer of 1919, Ruby-throated Hummingbirds collected in unusual numbers about a clump of Jewel Weed. Fourteen birds were counted on August 26th, and twelve on the 28th. This clump of weeds seems to have been the only attraction within a radius of some miles.

On August 26th, the same year, about an hour or so before dusk, an unusually large flock of Mourning Doves was disturbed feeding in a gravel pit. Forty-one birds were counted as they circled about.—C. E. JOHNSON.

BIRD ACCIDENTS CAUSED BY NETTING.—A Song Sparrow in Ottawa South entangled itself by the right foot in an expanded twist of poultry netting, breaking its leg by frantic exertions before it was released.

A Red-eyed Vireo killed itself in the same section of the city by coming in contact with a taut tennis net.

A Wilson Snipe on Echo Drive flew into a strip of poultry netting used as a support for Sweet Peas but in this case was only momentarily disabled.—C. E. JOHNSON.

HORNED LARKS IN A CITY GARDEN-PLOT.—During a severe blizzard on March 28, 1919, a flock of eleven Horned Larks visited a garden-plot on Sunnyside Avenue, Ottawa. Nine of the birds, accompanied by one Song-Sparrow, came back the next day to feed on the weed-seed. The Horned Larks secured the seeds several inches above their heads by jumping. On March 30th no Larks were present, but a flock of about thirty Redpolls settled for a few moments; so actively did they move about that an exact count of numbers was not obtainable.—C. E. JOHNSON.

THE EUROPEAN STARLING AT ARNPRIOR, ONT.—On the afternoon of the 19th of April, 1922, business took me to McLachlin Brothers' "yard office," which is situated about 300 yards from the east bank of the Madawaska River at Arnprior, on the open road leading to the Mill Bridge. Between the office and the river, and 200 ft. or 300 ft. back from the road are McLachlin Brothers' extensive stables. Consequently the vicinity is infested with English Sparrows, who find lavish food and safe shelter about the buildings. On this day the level rocky space between the road and the stables was dotted with Sparrows as usual and more of them were hopping in the roadway and chirping from the fences. The English Sparrow is the most uninteresting bird in the world, and I was paying little attention to their all too familiar antics, when, as I approached the yard office, I noticed a strange bird among them on the road.

Classification always begins by connecting the unknown with the known. Resemblances are noticed first, and differences only in second place. My first thought was: "That is a queer-looking Meadowlark, and if a Meadowlark, what is it doing here out of its proper range." However, in a second I saw it was no Meadowlark, but a species new to me. A little smaller than a Robin, it was a long-bodied bird that walked deliberately on its short legs with a rather waddling gait. In the shadow its color seemed uniformly dark all over, but when it flew up onto a fence post, and caught the sunlight, its speckled plumage gleamed with iridescent greens and purples. This was no native bird, and none that I had ever seen in the flesh before, but the picture of the European Starling flashed to memory, and I realized that this latest imported pest had reached these northern latitudes at last. The Starling somewhat resembles the Meadowlark, but the relationship is a distant one, and it is strange

that the likeness was evident enough to strike me when I got a first glimpse of the bird. An hour or so later I saw him again picking around the stable yard, and still consorting with the Sparrows, who, however, did not suffer him gladly, but attacked him if he came too close.

I have no sympathy with those ornithologists who seem to regard it as an offence in a bird to be rare, and immediately shoot any uncommon visitant. "That'll larn him to be rare!" But the Starling threatens to become as great a nuisance as the English Sparrow, and as an authentic record of its spread is valuable, I had no compunction in collecting this unwanted immigrant. Accordingly, not being a sportsman myself, I arranged with a friend in the yard office to shoot the bird on its next appearance. The following morning it could not be found, but in the afternoon I discovered it feeding among some small cedars behind the stables, and gave the alarm to my friend, who hurried out with the gun, and, to use the technical term, the bird was "taken." The specimen was sent to Mr. P. A. Taverner at the Victoria Memorial Museum, Ottawa, so as to make official record of the occurrence. For an ornithologist is always a doubting Thomas, and when you tell him about some unusual bird you saw, he may listen politely, but never really believes you, unless, applying an avian Habeas Corpus Act, you produce the body itself.

Chapman says the Starling was introduced into Eastern North America on several occasions, but did not gain a foothold in the country until an importation of 60 birds under the direction of a Mr. Eugene Schieffelin was set free in New York in 1890. Since then they have become firmly established in the New England States, and have appeared as far south as Alabama and west to Ohio. I understand that a specimen has been reported in Labrador, and this, with the bird collected at Arnprior, marks their farthest north to date. It is to be hoped that the subarctic winter of the Ottawa valley may keep us free from any large invasion of them, but they show remarkable hardiness.

The Starling is a favorite bird in Europe, making itself attractive by its familiar habits around dwellings, its handsome plumage, and its destruction of insects. But, like most other imported animals, its character seems to have changed in its new home, and here it is developing all the unpleasant manners and customs of the English Sparrow. It gathers around buildings in large noisy flocks and defaces the architecture with unsightly nests and droppings; and, while it is true that its food mostly consists of insects, at times it is known to cause severe damage to fruit. Worst of all, it is likely to drive away some of our most desirable native birds that now nest around our houses. Mr. Taverner makes the really alarming suggestion that it may dispossess the Purple Martin, which can withstand the Sparrow, but may not be able to resisit the equally aggressive and larger Starling. This would be a loss indeed.—CHAS. MACNAMARA, Arnprior, Ont.

NOTES ON A FEMALE NIGHTHAWK WITH YOUNG.—During the extreme heat wave which passed over Ottawa in July, 1921, a female Nighthawk shifted her two young across the gravel roof of a neighbour's sun-room. From July 3-6, with drooping wings, open mouth, and palpitating throat, she straddled her young, shielding them from the intense rays of the sun. July 7 being still higher in temperature, she moved them before noon a distance of about four feet to a shaded area cast by the projecting roof over an adjacent attic window. At 6 p.m. she had re-shifted them to their original position. July 8 was still very hot, 95.5°, and at noon she had shifted both young to the extreme side of the sun-room roof, some ten feet, to the shaded area of a brick chimney. At 6 p.m. she had again returned with her young to her original site. At all times, when observed throughout the day, she appeared to be suffering from the heat, in all probability intensified by the gravel coating of the roof. The young were about half-grown and unfortunately the female was not observed in the act of moving her charges.—C. E. JOHNSON.

STRANGE BEHAVIOUR OF A FEMALE YELLOW-BELLIED SAPSUCKER.—A pair of Yellow-bellied Sapsuckers were tapping a maple tree, the male about twenty feet from the ground, and the female some distance lower down. A friend collected the male bird, which remained caught among several small twigs. The female did not fly at the report but disappeared on the opposite side of the tree and began climbing up. Arriving at a point just below the suspended male, she reappeared, uttered excited notes and promptly pounced upon the carcass. The body was dislodged and she hurtled the entire distance to the ground with it, continuing to administer blows and leaving it only when we had approached to within four or five feet.—Ottawa, April 17, 1922, C. JOHNSON.

PARASITE IN A SALAMANDER.—On April 23, 1921, while I was overturning boulders along the edge of a small creek near Ottawa, two specimens of Two-lined Salamanders *Eurycea bislineata* were exposed. One of these had the tip of its tail amputated. When it was immersed in alcohol later, a species of roundworm similar in color and thickness to those found in grasshoppers was noticed protruding nearly a quarter of an inch from the mutilated tail-end.—C. JOHNSON.

The Canadian Field-Naturalist

VOL. XXXVI OTTAWA, ONT., SEPTEMBER, 1922. No. 6

A BIOLOGICAL RECONNAISANCE ON GRAHAM ISLAND OF THE QUEEN CHARLOTTE GROUP

By Clyde A. Patch.

AT 6.30 a.m. on June 21, 1919, in company with Mr. Harlan I. Smith, Archæologist, Victoria Memorial Museum, the writer left Prince Rupert, British Columbia, on the tug *Point Gray*, an oil burner engaged by the Munitions Board to tow spruce rafts from Massett Inlet to the mills at Ocean Falls. We arrived at Massett Reserve, Graham Island, about 3.30 p.m., where we were kindly received by Mr. Thomas Deasy, Indian Agent, and by Harry Wiah and Henry Edenshaw, Indians.

About 360 Haida Indians make their homes on the Massett Reserve and gain a livelihood by fishing salmon or by working in the salmon canneries. A few Indians plant small patches of potatoes but aside from this they are not successful agriculturists nor could they be expected to evolve in one generation from sea-faring people into tillers of the soil. We camped near the reserve wharf.

It was with true regret that we viewed the main street of Massett Reserve, which forty years ago was bordered with hewn-plank houses and liberally planted with wonderfully carved totem poles on which the eagle, raven, bear, human being, mythical "sea-dog," and the beaver—a design introduced from the mainland—were used as motives. The aboriginal-type houses have been replaced by smaller clapboard dwellings, and only two totem poles remain standing. At the long-deserted village of Yan across the Inlet from Massett Reserve several poles are still standing, and also several burial posts. These burial arrangements consist of two sections of log perhaps four feet in diameter and ten feet in height, set in the ground a few feet apart. Between the posts a carved and painted wooden box was constructed in which, from time to time as deaths occurred, bodies enclosed in smaller boxes were placed.

At intervals along the brow of the beach in front of the Massett village lie—cracked and disintegrating—the once cleverly hewn and painted canoes, which have been discarded for motor and row boats. These canoes, hewn from a single log, were sometimes made over sixty feet in length, and would carry forty persons. With the exception of Charlie Edenshaw, who is now blind, the expert carvers of gold and silver ornaments—hammered from coins—and miniature slate totem poles have passed away, and the rich-hued and durable colors made of stone dust and oil for use in basketry and other ornamentation have been replaced by dye and paint. A few of the handsome old cedar boxes, some of them as large as a trunk, with three corners bent and the fourth joined with wooden pegs and made from a single plank still remain, but the grotesque ceremonial masks and rattles and the picturesque hats woven of spruce bark have disappeared. I believe that within the next decade the true "oldtimers" will have passed on to the Happy Hunting-ground, and the Haida Indian and his works on Graham Island will be archaic.

New Massett with an all-white population of about seventy-five is three miles up the Inlet from the reserve. Excepting the grassy flats several square miles in area which border Delcatla Inlet, a branch of Massett Inlet, and are partly inundated at high tide, the vicinity of Massett is heavily forested. A wagon road connects Massett Reserve and New Massett, and from the latter place a road about a mile in length runs through to the north beach which, at low tide, is two and three hundred yards in width. Excepting at high tide the sea-packed sand of this beach makes a splendid roadbed for traffic between Massett, Tow Hill and Rose Spit.

On July 27, we moved camp to the bank of the Hiellen River at Tow Hill twenty miles from Massett. The three heavily wooded sides of Tow Hill, which rises to an elevation of about four hundred feet, are steep-sloping, while the seaward side is an almost perpendicular rock face protected at the base from sea erosion by a spray-washed point of solid rock. From Tow Hill several wagon roads with an aggregate length of about eight miles have been built, but some parts of them, owing to disuse, have become obstructed with alder growth and fallen timber. Human, cattle, and

bear trails form a network through the forest and across the muskegs from Tow Hill to the east beach and north to Rose Spit. While camped at Tow Hill we explored this area, about one-third of which is lakes and muskeg and the remainder forested with hemlock, Sitka spruce, red cedar, yellow cedar (rare), lodgepole pine, yew (rare), alder, crab-apple and willow, and has as an undergrowth huckleberry (both blue and red), salmon berry (both red and yellow), and sallal. The sallal, a rank-growing shrub attaining a height of four or five feet, covers large areas of the forest floor, and through it progress is almost impossible. In the dense portions of the forest the fallen trees are shrouded in moss, and the living ones festooned with moss and ferns.

No aquatic animal life was observed in the shallow lakes, and excepting the yellow pond lily there is very little plant life. The moss covered muskegs are studded with lodgepole pine, dead and living, and dotted with muck holes which gurgle under the weight of the passerby. In places the muck is eight feet or more in depth and the largest tree can be rocked to its roots bedded beneath the water-soaked blanket of moss which stretches and sinks a foot under one's weight. Except for the geese which roost there and an occasional bear or crane, there is very little animal life on the muskegs.

The Hiellen River, shallow and rapid, in a gravel bed, is inhabited by Dolly Varden trout, sculpins or "bull heads," as they are called by the settlers, and, during the spawning season in September, by humpback salmon.

Over the area explored there are dotted perhaps two dozen log cabins all abandoned but five, the builders having, after three or four years' residence, found the natural conditions too unresponsive to hard labor. The present settlers have each a herd of thirty or so head of cattle, which, with the aid of a small amount of slough grass hay, forage for themselves throughout the year, and, along with his garden for home use, net the settler a living.

Solid rock at the point which stands above high tide, with low rock pinnacles and seaweed covered boulders forming the central portion, and wooded at the base, Yakan Point, situated two miles west of Tow Hill, extends a quarter of a mile out into the sea.

Strewn with driftwood above storm tide, Rose Spit (Rose Point) is simply a barren, tapering ridge of sand several miles in length which continues several miles farther as a treacherous sandbar under the sea.

During the greater part of our stay the weather was clear and cool, a rainy period seldom lasting more than three days. There were a few black-flies, mosquitoes were not uncommon, and the tiny "no-see-'em" flies were abundant and very annoying.

On September 12 we returned from Tow Hill to New Massett, and about 7 a.m., September 28, boarded the S.S. *Prince Albert* on her way up Massett Inlet to Port Clements, returned to Massett for freight (saw very few birds up the inlet) and left again at 3.30 p.m. Arriving in Prince Rupert at 1 a.m., we boarded the S.S. *Prince Rupert* and landed in Vancouver at 4 p.m., September 30.

As will be seen by the appended list, the avifauana of the northwest portion of Graham Island is varied and abundant. In addition to those here listed a number of additional species have been observed by other collectors, and as there are mainland islands less than thirty miles distant almost any mainland species may be expected. Three birds inhabiting Graham Island have been described as specifically new to science, and there are indications that others will be found peculiar to these islands. No butterflies have been recorded from the Queen Charlotte group, and neither have snakes, turtles, lizards, salamanders, or frogs; the only cold-blooded vertebrate other than fishes being the toad common to the west coast. An Easterner quickly notes the absence of such familiar mammals as the squirrels, muskrat, hare, foxes and woodchuck. Thus far only eleven varieties of native land mammals have been recorded from Graham Island, four of these being bats. Of the eleven varieties at least six have been described as species or subspecies new to science. The Indians when asked how the mammals got on the island replied to the effect that their ancestors brought representatives of each species. Perhaps they did, either accidentally or intentionally.

As caribou existed on Graham Island and the foreign deer seem to be thriving, the advisability of introducing other game mammals would seem worthy of consideration.

The specific annotations and titles for the list of birds were supplied by Mr. P. A. Taverner, Ornithologist to the Geological Survey of Canada.

MAMMALS

Orcinus orca. KILLER WHALE (?).—Chief Harry Wiah said that two years prior to our visit, while picking strawberries near Chown Point on the north beach, he saw more than thirty seals come on the beach, and, lying as flat as possible, refuse to be driven into the water. Harry claimed that a whale had pursued them and they were thus avoiding him.

RED DEER.—About two years prior to our visit a buck and three does were introduced from some mainland park. The buck became so vicious that his destruction was necessary. Members of our party observed the three does, a spike buck and a fawn. These deer were seen first near Massett and later near Tow Hill.

Odocoileus columbianus subsp.? BLACK-TAILED DEER.—Mr. Carpenter informed me that dead deer are sometimes washed up on the beaches, and during our stay at Tow Hill he observed one near Rose Spit but it was carried away by the sea before I could secure the skull.

"WILD CATTLE."—The so-called "wild cattle" were the descendants of some Short-horn stock that was brought to Graham Island about thirty years ago, by a man whose name is said by Mr. Dave Rutten of Massett to have been "Alexander." For several years, during the absence of the owner, these cattle were neglected and allowed to roam at will. When an effort was made to round them up on Rose Spit they broke away, and after several further unsuccessful attempts to capture them had been made, they were abandoned by the owner. Up to two years prior to 1919 when the last animal is believed to have been killed, the settlers shot these cattle at every opportunity for meat. One of the settlers is said to have captured a cow and a heifer calf, which are believed to be the only wild cattle taken alive. Owing to the fact that the wild bulls sometimes associated with the settlers' cattle, individuals in the settlers' herds show relationship to the hardy, wild Short-horns. The greater part of the foregoing information was given to me by Mr. Cecil Baker of Tow Hill.

Rangifer dawsoni. DAWSON CARIBOU.—None of the Indians with whom we came in contact had heard anything relating to the caribou of the Virago Sound district since the 1910 expedition of Mr. Francis Kermode, who saw tracks of what he thinks may be the surviving individual of the four caribou seen by Indians in 1908 when the three specimens in the British Columbia Provincial Museum were taken.

Mus norvegicus. NORWAY RAT.—I shot a two-thirds grown specimen in the cabin at Tow Hill.

Peromyscus keeni. KEEN MOUSE.—Ten specimens were taken in the forest near Massett Reserve. A jay was observed to capture a half-grown specimen

Ursus carlottæ. QUEEN CHARLOTTE BLACK BEAR.—On July 10 a female specimen measuring 57 inches in length was purchased from Indians who took it on the beach between Virago Sound and Massett Inlet where accompanied by two cubs said to be large enough to shift for themselves, it was feeding—Henry Edenshaw said—on insects found under the sea-weed strewn on the beach. Bear tracks were fairly common in the vicinity of Tow Hill and on several occasions bear tracks and scattered leaves indicated that bears feed on the roots of skunk cabbage. During our stay at Tow Hill a large bear was chased along the road back of the Hill by Cecil Baker's dogs. During the winter preceding our visit several bears were taken between Rose Spit and Tow Hill.

Lutra canadensis subsp.? LAND OTTER.—Chief Harry Wiah told me that during the winter of 1918 he trapped seven otters on the west side of Massett Inlet.

Putorius haidarum. HAIDA WEASEL.—Mr. Cecil Baker informed me that nearly every inhabited cabin harbors a weasel, which is unmolested because of its ability as a mouse catcher.

Mustela nesophila. QUEEN CHARLOTTE MARTEN—Chief Harry Wiah said that during the winter of 1918 he trapped twenty-one martens on the west side of Massett Inlet.

Latax lutris. SEA OTTER.—I found a sea otter skull in a deserted cabin near Rose Spit. Chief Harry Wiah said that about a year before our visit an Indian shot at a sea otter which was resting on kelp near North Island. He also said that about thirty years ago his father, his wife's father, and other Indians—a total of nineteen boats—got twenty-one sea otters in a forenoon and six in the afternoon.

Eumetopias jubata. STELLER SEA-LION.—A young male, the only specimen observed, was taken on Yakan Point.

Phoca vitulina. HARBOR SEAL.—Twenty or so seals were frequently observed on or near the sand bar on the east side of the mouth of Massett Inlet. Seals were also seen resting on the point of Rose Spit. (Under "Killer Whale," see reference to seals and whale.)

Sorex longicauda elassodon. QUEEN CHARLOTTE SHREW.—Three specimens were taken in the forest near Massett reserve where they inhabited the same localities as *peromyscus*.

Myotis sp.? BAT.—Bats were several times observed at Tow Hill.

BIRDS

Aechmophorus occidentalis. WESTERN GREBE.—On September 5, eight birds were observed just off the rocky point at the base of Tow Hill.

Colymbus holboelli, HOLBOELL GREBE.—Near Rose Spit, on August 1, I observed twenty-eight birds of this species a hundred yards or so off shore

Gavia imber. LOON.—Both adults and birds of the year were observed. Two, three or four were usually seen a hundred yards off shore in the course of a day's walk along the north or the east beach. No individuals were observed on the lakes visited.

Gavia stellata. RED-THROATED LOON.—A few individuals were observed in Massett Harbour and in the vicinity of Yakan Point. "Charlie" Spence of Massett informed me that this species breeds on Lumme Lake.

Cerorhinca monocerata. RHINOCEROS AUKLET.—Fairly common in Massett Harbour. Adult, Massett, July 17.

Ptychoramphus aleuticus. CASSIN AUKLET.—The remains of three birds of this species were found on the top of Tow Hill, where they had been carried and partly eaten by the falcons. One pair of wings, July 28.

Brachyramphus marmoratus. MARBLED MURRELET.—Not infrequently observed in Massett Harbour, and less frequently about Yakan Point. In Massett Harbour they were several times seen in companies of two. Massett, July 5, July 10. "Both in dark mottled plumage."

Cepphus columba. PIGEON GUILLEMOT.—Fairly common in the mouth of Massett Inlet. No birds of the year were observed.

Larus glaucescens. GLAUCOUS-WINGED GULL.—Two or three hundred adults and birds of the year were frequently present about Massett Reserve, Yakan Point and Rose Spit. Mr. Edward Hodgson, 2103 Fernwood Road, Victoria, B.C., informed me that gulls nest on Jacac Island which lies northeast of Graham and is near Dundas Island. He said that gulls also nest in great numbers on Grass Island on the west coast. Juvenile, Rose Spit, August 1; adult, Tow Hill, August 7. "The juvenile is at least a year old, as shown by the wear on the feathering, and is in full moult. However, the incoming plumage seems that of a bird of the year, being more like the first than what would be expected as the second winter plumage. The old plumage, including primaries and tail, is very worn and ragged, and bleached pale. The incoming plumage on the back is almost solidly dark, showing very little of the vermiculation of the juvenile. This looks like a case of arrested development, and an approximation to a reproduction of a juvenile plumage when a more mature one should ensue. This may sometimes occur in subnormal birds, especially amongst the gulls. The adult specimen seems about normal."

Larus argentatus. HERRING GULL.—Less common than the Glaucous-winged Gulls with which they mingle. Three specimens, Rose Spit, August 1; Tow Hill, August 7. "Except 14102, the remains of the passing plumage are very greatly worn and faded, as if it had been retained considerably beyond its proper time for replacement. I think this is likely true of most of the summer Herring Gulls on this coast, as on Lake Erie, that have not repaired to their more northern breeding grounds. None of these birds has the grayish wing-tips of *thayeri*, but what black tips are indicated are pure and deep like those of *argentatus*."

Phalacrocorax pelagicus robustus. VIOLET-GREEN CORMORANT.—Not uncommon in Massett Harbour, and a flock of forty or fifty frequented Yakan Point and vicinity during the day and spent the night on the small ledges of the perpendicular, seaward face of Tow Hill. The chief food is probably sculpins. Tow Hill, August 7, "much worn and faded"; Tow Hill, August 7, "moulting"; Tow Hill, August 7, "mixed ad. and jv. plumage."

Mergus sp.? MERGANSER.—Seldom observed until September, when two flocks of eight and eighteen were observed, both on salt water and all in gray plumage.

Lophodytes cucullatus. HOODED MERGANSER.—Eleven individuals were observed on the lakes. None of them were adult males. Juvenile, Tow Hill, August 9.

Anas platyrhynchos. MALLARD.—Fairly common. More frequently observed as the season advanced and the young birds began flying. Cecil Baker, residing near Tow Hill, informed me that this species breeds back of his cabin on a muskeg which contains several small ponds. Massett, September 12.

Nettion carolinense. GREEN-WINGED TEAL.—First observed on August 21, and shortly after appeared abundantly, particularly in the lee of Yakan Point, where flocks of 200 and 300 were seen. I also observed it on Silver and on Mica Lake, and it is said by the settlers to frequent the rivers. Juvenile, Silver Lake, August 21.

Dafila acuta. PINTAIL.—Three female or immature specimens were observed near Tow Hill, September 5. Tow Hill, September 5.

Harelda hyemalis. OLD-SQAW DUCK.—From July 27 to September 5, a total of five birds was observed in the vicinity of Yakan Point. One of these was within easy gun shot, but as we had no boat it could not have been secured.

Oidemia americana. AMERICAN SCOTER.—From July 30 to September 5, a male bird, probably the same individual, was three times observed near Yakan Point in company with White-winged Scoters.

Oidemia deglandi. WHITE-WINGED SCOTER.—Common in water adjacent to all the shore line explored. During the latter part of August the moulting period was apparently in full swing as the beach was frequently littered with feathers. I observed an adult male which had moulted all of the primaries and, as the new feathers were only about one-fourth grown, was unable to fly. Massett July 5. "Old plumage very much worn and faded."

Oidemia perspicillata. SURF SCOTER.—A flock of six was observed on August 7, near Yakan Point.

Branta canadensis subsp.? GOOSE.—Fairly common on the rivers, lakes and muskegs. On August 21, fully 150 were seen on Mica Lake, which is about a mile long by an eighth of a mile wide. The

settlers not infrequently find nests. Silver Lake, August 21; Mica Lake, August 22; 3 specimens, Tow Hill, September 2. "These specimens are very dark below but do not seem to be quite referable to *occidentalis*."

Olor sp.? SWAN.—Mr. Ronald Curry, living near Silver Lake, told me that nearly every spring and fall these birds visit the lake in small parties; the largest that he had observed numbered fourteen. Mr. James Martin, merchant at Massett, informed me that he had seen Swans during the summer months on the lake at the head of Massett Inlet just east of McClinton Bay.

Ardea herodias fannini. GREAT BLUE HERON.—One or two individuals were usually observed in the course of a day spent about Massett Inlet or the small inland lakes. The chief food is probably sculpins as the birds frequented localities where these fish were plentiful. Juvenile, Massett, July 1. "Clearly *fannini*."

Grus sp.? CRANE.—On several occasions their weird cry was heard after night-fall at Tow Hill, and on September 5, two birds were observed out of gun range on a small muskeg near Lumme Lake. The settlers informed me that the cranes are very wary, and that they frequent the muskegs. "Without specimens the identity, whether Sandhill or Little Brown Crane, can only be surmised. The former, *G. mexicana*, is the geographical probability."

Gallinago delicata. WILSON SNIPE.—On September 22, nine individuals were observed on the flats bordering Delcatla Inlet.

Pisobia maculata. PECTORAL SANDPIPER.—On September 20 eighteen birds were observed in small parties scattered over the grassy flats bordering Delcatla Inlet. The local settlers call this bird "Jack Snipe." Three specimens, Massett, September 20; Massett, September 26.

Pisobia minutilla. LEAST SANDPIPER.—On August 9 a solitary specimen was collected on the rocks at the foot of Tow Hill, and on August 21 an individual was observed on the beach near Tow Hill in company with Western Sandpipers. Juvenile, Tow Hill, August :9.

Ereunetes mauri. WESTERN SANDPIPER.—Seen on the beaches throughout our stay in flocks of from eight to three hundred. Individuals of the species were seen in company with Sanderlings and with Semipalmated Plover. Two specimens, Massett, June 25; seven specimens, Massett, July 5. "Though these are all adults, variation in color and size of bill is evident."

Calidris leucophæa. SANDERLING.—During August and September, several flocks, the largest estimated at 400 individuals, were seen on the beach between Yakan Point and Rose Spit. This species was sometimes accompanied by Western Sandpipers. Five specimens, Rose Spit, August 1. "These are all adults with breasts quite strongly reddish."

Totanus melanoleucus. GREATER YELLOW-LEGS.—Two specimens were observed and collected in the shallow margin of Silver Lake, on August 21. Two specimens, Silver Lake, August 21.

Heteractitis incanus. WANDERING TATTLER.—On August 25 and September 5, flocks of five and seven respectively were seen on the beach near Yakan Point. Two specimens, Tow Hill, August 25; three specimens, Tow Hill, September 5. "All in juvenile fall plumage."

Actitis macularia. SPOTTED SANDPIPER.—From July 27 on, several individuals and parties of three or four were observed near the mouth of the Hiellen River. All were juveniles. Juvenile, Tow Hill, August 7.

Charadrius dominicus fulvus. GOLDEN PLOVER.—On July 27, two individuals, one of which was collected, were observed on the north beach between Skonun (Chown) Point and Yakan Point. Massett, July 27. "This is an adult in not quite full plumage, changing into winter. The old plumage below consists of black and white feathers both much worn and apparently of equal age. The new is considerably more fulvus than comparable eastern birds. On the back the spotting of the old plumage is faded to nearly white whilst the new is a full, pure golden."

Ægialitis semipalmata. SEMIPALMATED PLOVER.—Individuals and small flocks were seen on the north beach between Massett Reserve and Rose Spit. On June 24, I observed at intervals along the north beach about three miles from Massett Reserve, eight birds which appeared to be four mated pairs. By voice and action they endeavoured to draw us away from the sandy, driftwood-covered flat where they probably had eggs or chicks. On August 30, I collected a birdof the year at Silver Lake. Two specimens, Massett, June 25; Rose Spit, August 1; Juvenile Silver Lake, August 30.

Aphriza virgata. SURF-BIRD.—Three individuals were collected on the rocks and the beach in the vicinity of Tow Hill. A specimen taken August 21 was in company with three Black Turnstones, the other two were solitary birds. Tow Hill, August 2; Rose Spit, August 20; Tow Hill, August 25. "All in full fall plumage. (Juveniles?)."

Arenaria interpres morinella. RUDDY TURNSTONE.—On September 5, three birds were observed on Yakan Point in company with eight Black Turnstones. Tow Hill, September 5. "Adult in full plumage."

(*Concluded in the October issue*)

WINDOW-PANE VISITORS IN YARMOUTH COUNTY, NOVA SCOTIA

BY E. CHESLEY ALLEN

BEYOND the western shore of the lake the outline of the forest stands out jagged and dark against the sunset sky, and with the dying evening breeze the mirrors, that have been forming in the little coves, creep forth and grow until they cover the lake's broad surface, and throw back in faithful detail the wooded margins beyond.

The bird chorus has ceased, save where from the dead top of some tall spruce the White-throat's crystal song floats out across the clearing, or high in the air the Nighthawk catches himself on vibrant wing.

The shadows deepen. The dark green of the firs is turning to black, and the ferns of the forest floor become lost in the deepening shadows. Now little is distinct but the white ghostlike trunks of the birches. The twilight birds have ceased; and the only sound is the long, weird wail of the Loon echoing from the lower lake.

We retreat to our little cabin, and a lamp is placed in the long, low window. Almost immediately, from out the mysterious recesses and long dark aisles of the forest, there come to our window panes strange troops of fairy-winged creatures, large or small, of many colours, plain or gaudy, but each after its own kind bearing the stamp of nature's infinite and inexhaustible beauty.

The first to arrive is a troop of tiny moths, so tiny as hardly to be recognized as moths. They alight on the pane closest to the bright light, and circle rapidly about and among each other in a puzzling series of gyrations, like whirligig beetles on the surface of some quiet pool. Move the lamp up or down, or from side to side and they follow its bright lure, but never cease that tireless, mazy dance.

Now the gay figure of the tiny dancer is broken for a moment as a great brown body bounds against the glass and is gone. But it has not gone far. Out there on the edge of the light it stops and poises over the tempting horns of the honeysuckle—a beautiful trim hawk moth, (*Hyloicus kalmiæ*). Just below, over another cluster of bloom, hovers a relative, (*H. gordius*), dressed in sober black, white, and gray. It is these moths that are so often mistaken for Hummingbirds, as they poise on their mazy wings over the fragrant flowers; but the hawk moths fly only at dusk or later, when the tiny wings of the Hummingbird have been folded for the night. Later in the evening other hawk moths will come to our window—*Darapsa pholus* in a livery of rich brown and tan, and *Sphinx geminatus* with a double spot of blue set amid the rich rose-color of each hind wing.

Let us turn again to the window Up in the corner of this pane a "plume-wing" has settled, and holds her odd little wings as straight as if the first duty of a "plume-wing" was to form a perfect capital T.

Down here on the sash a pale green may-fly has settled, and there, scuttling across the glass is fierce dobson. Both have come up from the lake, and tomorrow we may find still clinging to the side of our boat, or to the stones along the shore, the empty tell-tale cases that these winged creatures have left as evidence of their one-time lowly life beneath the water.

Now, fluttering against the glass, is a most beautiful pattern of pale yellow and rose pink—the Rosy Dryocampa. When we look upon the beauty of a creature like this we can more than half forgive the green striped caterpillar that disfigured our maple last summer.

In sharp contrast to the fair beauty of Dryocampa is this next dark-robed visitor. Ctenucha seems at first to be clothed in black, but closer observation shows her robe to be of rich dark brown, the hind wings and body covering forming an underground of deep metallic blue. As if to relieve the gloominess of so sombre an attire her head and shoulders are decked in rich orange.

Here, one after another in quick succession, come a whole troop of gay crocus geometrids, (*Xanthotype crocataria*), the rich deep yellow of their wings spotted and blotched with bronzy purple. The geometrids do not blunder against the glass like some of the heavier moths, but flutter down out of the night like falling leaves, poising their wings above them like airy butterflies Others follow. Here a beautiful little "beggar moth," (*Endule mendica*), with iridescent transparent wings. There a "scallop-shell", with wings barred in finest alternate lines of brown and white. Still others come Geometrids with pale green wings; with wings of creamy yellow crossed by one dark line; or with wings bearing intricate lace-like patterns of black and white.

During a momentary pause a beautifully mottled being strikes sharply against the glass and falls fluttering to the ground. Directly it rises and settles upon the window casing. This is *Hyphoraia parthenos*, a rare northern tiger-moth. The fore wings are deep rich brown broken by white spots and the hind wings banded with black and yellow,

reminding one of the "underwings". A rare visitor indeed! But we have scarcely ceased to congratulate ourselves when another unexpected beauty arrives. This is late July, but there against the sash is one who has tarried behind her gay June companions—pale Luna. Ah! well may she be called the "queen of the night"; for of all the gay procession no creature can excel her for the dainty refinement of her pale green jewel-set apparel, bearing its delicate train.

Far into the night the fairy pageant continues, and reluctantly we darken the light that lures to us these winged gems of the forest.

A strange touch of mystery there is about this infinite nightly tide of living forms from which a small side current is turned for a moment by the lighted window of a little cabin. Whence its source? Whither its goal? In answer to the first we stumble across stray fragments of evidence. This afternoon we were sitting by the gnarled roots of an old yellow birch. As our eyes wandered lazily over the brown and yellow pattern of last year's fallen leaves, they involuntarily became focused upon a fragment of colour of peculiar shape. As we looked closer it transformed itself into a yellow and brown geometrid, resting with wings pressed flat against a rolled leaf. The fresh perfection of its wings led us in curiosity to unroll the leafy cylinder, and there, within, we found the newly broken pupa case. Here this bit of perfect beauty had escaped through fall and winter the bustling search of the migrant sparrows, and the prying eyes of the brown wood mice. The other day we lifted a loose flat stone, and there, firmly fixed to its lower surface, was the brown, furry cocoon of a tiger moth. Or again, from the open end of that tough silky little bag that we raked up with the brown leaves had come a brown-winged Polyphemus

And whither? To mate, and lay their eggs, and die. But not so with all. In the very corner of our little illumined window is a fine spun web of silk, and crafty Arachna sees many a tiny moth and dainty mayfly become hopelessly entangled in her silken threads. And she is only one of a countless sisterhood; for by the tell-tale dew we see that every tree and bush is hung with treacherous nets. A little higher, on the border of the zone of light, dark figures flit back and forth along the level of the eaves The brown bats have learned that in this artificial twilight is good hunting, and the many-colored wings that strew the ground next morning show that scores of fairy visitors never quite reach the luring light. Others, momentarily stunned by the treacherous glass, fall fluttering to the ground and mysteriously disappear. Does even Mother Earth herself turn traitor to these, her children, and swallow up their fluttering forms? We stoop to look for the last that fell, and find, sitting beneath the cabin wall, dark toads. Those close-shut mouths look innocent enough, though this big fellow in the middle is gulping and swallowing in a rather suspicious manner.

But in the face of countless enemies the tiny eggs of next year's myriad forms are left in quiet pool, on blade of grass and tender leaf; and if we too are spared to come next year to this, our little cot among the trees, we'll greet again the little people at our window-pane.

RAMBLING BY THE GRAND RIVER

BY MARY PETTIGREW

THERE are many lovely places all over Ontario for the outdoor lover to explore and I have had brief excursions through a few of them, but the one district I know best is the Valley of the Grand River, particularly the fourteen miles of its course between the towns of Galt and Paris.

Our home was in Glen Morris, a tiny village halfway between these two towns, and the woods climbed up the hill almost to our back door, so pine branches beckoned and birds called us irrestibly to explore the shadowy, sweet-smelling ravines of the wooded, hilly country along the Valley of the Grand.

It is a country of ravines. You walk across what appears to be a level field, and are surprised to see before you tree tops on a level with your feet. These are growing along the sides of a basin hollowed out in the gravelly soil, and on coming to the edge you look down on a circular amphitheatre full of trees, and usually a pond or marshy spot at the bottom. The slope is easy enough to descend, but it is steep, and it is hard work to climb out again on a hot day. Sometimes the ravines are long and narrow like the valley of a stream, but blocked abruptly at either end by a small hill.

In one place there is a series of five ravines in succession. On climbing out of the first, the rambler stands on a ridge, looking down into a second, and so on through ravine after ravine, until, climbing out of the last, he stands on the highest ridge and looks down over a level space covered with hazel bushes, young pines, and maples, to the River flowing close in against a high, gravelly bank, down which, year by year, cedars and white

birches are sliding to their death in the spring flood.

It was on this ridge, looking back towards the fifth ravine, that I saw the top of a maple apparently blooming with a gorgeous red blossom, and until the flower took wings and flew away, I did not realize that it was a Scarlet Tanager.

These ridges between ravines are almost solid gravel, and once the turf is broken, the trees commence to slide. On the highest ones, the rambler often finds granite boulders, gray or pink, all carefully smoothed and with rounded edges. One farm near Galt is known as "Granite Hill," and its original owner, with great toil, rolled the boulders off his farm to form a fence, or rather a barricade along the road. Under these alien rocks, when spring comes, Blood Root, blue and yellow Violets, and Trilliums grow.

At the bottom of the ravine back of our house, a path runs along an old watercourse. In spring it is always very dark and silent there. The pines are so thick and the ground is deadened with their brown needles, so we used to hurry through to look for hepaticas on the sunny hill sides. But about the 24th of May, the pale mauve flowers of the wild geranium appear, and the sides of the ravine are fluffy with Meadow Rue and the white foam of Mitrewort. Strawberries ripen in open spaces where the trees have been cut, and last summer one sun-lighted space by a hemlock was haunted by black-winged damsel flies with iridescent green bodies.

The path leads past an old lime kiln with oak ferns among its mossy stones to a swamp full of cedars, cinnamon fern, tamaracks and plumy grass. All the old cedar stumps are overgrown with Linnæa Gold Thread, Star Flower, and tiny green Mitrewort. On summer nights, sometimes a western breeze carries the breath of the swamp, a mingle perfume of ferns, sweet flag, and twin-flowers, up over the hills, while Whip-poor-wills are calling. The twin bells of the Linnæa and the white velvet stars of the Partridge Berry Vine have the sweetest perfume of any flowers I know.

This swamp is a happy home for butterflies, Silver Spots, Wood Satyrs and Nymphs, and Thistle Butterflies. Along the wood road at the edge of the swamp the earliest butterfly to be seen is the Common Blue. This we used to call the "Hepatica" butterfly, because its wings look like Hepatica petals that have floated away on the wind. Red Admirals, Commas, the Camberwell Beauty, with bedraggled wings at this season, and Tortoise Shells are plentiful too in the warm spring sunshine. In May and June dragonflies dart up and down this road, and the air sparkles with the flash of their shining wings. They are mostly Libellulas, very tame and easy to catch. They would alight on my hat or shoulder if I stood quite still by their favorite resting places. This road leads down to several open fields along the river, and last June over these fields coursed strong, swift-flying dragonflies that gave the collector a run for his money.

It is pleasant to tramp through this swamp over hummocks and rotten stumps, carefully avoiding watercourses outlined with marsh-marigold leaves, to the River. Here are thickets of grass and sedges up to the shoulder, stunted willow bushes, balm of gilead, and plantations of sweet flag and jewel weed. The trampled mint delights the nose, as you push through these plants to the water's edge, where mayflies, mosquitoes, moths and damsel flies dance over the brown flowing water.

To describe something that has always been familiar is not easy, but you may know my infatuation for the Grand and its valley, when I say that I was disappointed in the St. Lawrence. Not, of course, in the wonderful stream itself, but in the scenery along its banks.

The Grand River has its origin in Luther's Swamp in Dufferin County, but I have never seen the stream until it reaches Elora, where it has made a wonderful gorge for itself, cutting through layers of limestone. The beauty of scenery at its junction with the Conestogo is well known to artists, and also that at Doon, where it winds along a very high, steep bank, not unlike Scarboro Heights, only the formation is more of gravel than of clay. But the bank is cut into crevices, and the rambler looks down over poplars, brambles, sumach and golden rod to the curving river and can watch its silver spirals for miles. On the top of the western bank is Cressman's Bush, the only bit of virgin forest left in the neighborhood. It has been saved from the rapacity of sawmills largely through the efforts of Homer Watson, the artist. While passing under the shadows of these ancient hemlocks and elms, the rambler gets a faint idea of the awfulness of a great untouched forest. In the semi-dark no little friendly wood plants can grow, and it is a relief to come out of the shadow to an open space matted with partridge-vine glowing with scarlet berries.

From Galt on, the bed of the river is limestone, rocky and broken for the most part, but two miles above Glen Morris the formation known as Guelph dolomite crops out in great stretches, level as a floor. Where the current is swiftest this is cut into narrow channels, anywhere from two to five feet deep, and the joyous wader paddling along this level floor with warm, brown water lapping against bare feet, has to watch his step when he comes to the brink of one of these channels, and if it is too wide for a jump, must wander along its edge up or down stream until a narrow place is discovered, or a boulder bridging the channel.

What a paradise the Grand River Valley must have been in the days of the Indians! It should really belong to them yet, for six miles on each side from source to mouth was once set aside by the Government for the Six Nations. In their day the rolling hills were covered with the greatest variety of trees, some of the wonderful stumps of which remain as monuments. There were pines, elms, oaks, maples, nut trees, hickory, butternut, chestnut and beech, also hazel nut bushes. Even yet, the woods give the rambler a variety of delightful things to eat, maple sap and sap icicles, when the snow begins to melt, then, later, wintergreen and partridge-berries fresh and firm from under the snow. Spring brings pungent pepper-root from the black earth of the swamp, watercresses from the streams, and morels from the meadows. In early summer, the rambler finds young, golden-green wintergreen leaves, two varieties of wild strawberries and June berries. Then in summer there are black and red raspberries, blue berries and thimble berries, and in the fall, butternuts, hickory nuts, chestnuts and hazel nuts. The rambler may spend happy afternoons in the fall beside a flat, limestone rock with a heap of hazel nuts or hickory nuts at one side, and a small round stone in the right hand.

So the Indians must have had plenty to eat, for game was also abundant in the Valley—deer, and wild duck, and partridge—and the river and the creeks were full of fish. The river is now polluted by the towns along its banks, but the creeks are still clean, and in the hope of preserving what we have, the outdoor lovers of the neighborhood have formed an Association to protect wild life for three miles on each side of the river, so that birds, small animals, and fish may have a Sanctuary. The protected area will extend from Galt to Glen Morris, I hope, but it is only half way, so far.

The early settlers tell us that originally the river flowed deep and full among its many islands until late July, and that the dreadful spring floods of later years were unknown. The islands were wooded, principally with great elm trees. The ice freshets of many springs have battered against the trunks of these trees, grinding their bark to matchwood, and, one by one, the few that were left when my memory of the river began have fallen, and, undermined by the flood, have been carried away in the turbid torrent. I am mourning two great trees, the last ones, that disappeared from the island under the bridge at Glen Morris this spring. The flood is a wild, foaming torrent, as unlike as possible to the gentle brown stream of the summer, and flows far beyond the confines of its banks. After the waters have abated, I have walked among the trees and noted the cruel marks of the grinding ice cakes, in the torn and splintered bark, higher above my head than I could reach.

Springs of clear, cold water rise all along the river banks. On the east between Galt and Glen Morris are seven springs, one for each mile, so the foot passenger need never thirst even on the hottest day. The rambler should make it a point to drink at each one when tramping the seven miles. One stream rises under a cairn of petrified stones, and we always call it "Sweet water" because of a fancied taste of sweetness that does not seem to belong to the other six. All these springs are heavily charged with lime and twigs, mosses, and stones touched by the water gradually become petrified.

Besides the seven springs there are two large creeks on the east side, with cresses and water weeds along the edge, where people still fish for speckled trout. I have followed one almost to its source, but the other remains to be explored. At Galt, Mill Creek, a really lovely little river, enters the Grand. It passes through a park, and is guided into several pools where the boys and girls can splash in absolute safety, and in water that is purer than the drinking water of most cities.

There are not so many springs on the west bank, between Galt and Glen Morris, but there is one creek called Glen Burn, which is a great favorite of mine, because it can be followed up to its source in a lake, which we call "Lime Lake". Nearly all the lakes in the valleys of the hills above the river are on the west side. Most of them are the centres of swamps and are gradually drying up. The water is brackish and not fit to drink, and their beds are quicksand or black swamp mud, ideal for waterlilies, arrowheads and bulrushes, but bottomless for anyone who chances to fall in.

"Lime Lake", where the Glen Burn creek rises, is different. Its water is clear and "hard". It is fed from lime springs rising along its banks, and its bed is white lime, also "sinking sand", but you can wade out a long way without danger of being mired. One of its springs rises under a grassy mound and you can see the water bubbling up slowly through the white lime particles The last time I was there, an Eglantine bush was is bloom, and the faint pink petals of the sweet briar roses had fallen into the spring, and were drifting down to the lake, little fairy boats, on the clear water.

Besides the lakes there are dozens of ponds which do not dry up entirely except in an unusually dry summer. These are fascinating places all the year, but particularly in the spring. When the first hepaticas bloom, if you kneel on a log and dredge down in the brown water, amongst scum and withered leaves and broken dried grasses, you discover frogs' eggs in jelly, red water spiders, fairy shrimps, water boatmen, and electric light bugs in their aquatic stage, tiny lizards and caddis cases, and damsel-fly nymphs. Plunging down deeper,

your dredge comes up with dragonfly nymphs butting through the mud Almost every pond has its own characteristics. In one, the fairy shrimps may be large and red, and in another they cannot be found at all. Some ponds are afloat with empty snail shells, anchored in shoals among the water weeds. Water striders dance, and mosquito larvæ are wriggling in every pint of water. There is an odd little gray shrimp that wriggles in dozens through the mud in every netful taken from these ponds.

Damsel-fly nymphs are to be found very plentifully among the weeds in the Glen Burn creek, also tiny clam shells and newly hatched crayfish. These are little gems with coral claws, and their bodies are almost transparent. In this stream some of the caddis-cases are made of tiny grains of sand and glitter like mica. The caddises I have met have many styles of architecture for their houses, stone, log cabin, stucco, and thatched. In May every stick and stone you lift out of Glen Burn has stonefly larvæ clinging tightly to it.

I must tell you about one more stream on the west bank. The hill behind it is almost a precipice, and its surface is covered with earth that looks like powdered lime. The material scratched out of the woodchuck's front door looks like the product of an old lime kiln. On this hill streams burst out anywhere and move on to a fresh site at their own sweet will. But things grow just the same, the usual elms and maples, great tall cedars, and a few pines. The ground is covered with velvety leaves of wild ginger, meadow rue, and maidenhair fern. The principal stream is a gusher, and one wet summer, years ago, it carried down a good half of the hill, trees and all, and laid them on the flat limestone floor of the river. In doing this it cut a deep little gorge for itself, and one hot summer we camped there. When the temperature was hovering 'round the '90's, it was always cool in the gorge, and we even enjoyed bathing in the icy water. There is just room for a tent on the bank where the stream leaps to the river, and one night I wakened and heard the stream singing over and over the notes of a clear wild song of its own.

One of the roughest trips known to me is a journey up the gorge of this stream to the great hole left in the hill after the "washout". The water is so cold that you cannot wade in it long, and, clinging to old roots and cedar branches, slipping on the slimy marl, or sinking ankle deep in the cool wet moss, deafened by the sound of the water, you climg up and up, until you see the stream shooting out from the side of the hill like a tiny Niagara. It changes its place year by year. Last summer there were three springs bursting out from different points.

The flowers that grow in the Grand Valley are a delight, from the first hepatica to the last fringed gentian. In the woods near the more inaccessible lakes there is still Trailing Arbutus, protected by the swamps being so full of water in the spring that it is impossible to get across to the hillls where it grows. Blood Root looks very pretty growing among the waterworn limestone boulders, and, later on, trilliums take their place. Last spring in the woods above Glen Burn, the trilliums were like a white sheet, spread among the trees. In June the woods at Glen Morris are full of fringed Polygalas, orchid-coloured, and the Pyrolas, Shin Leaf, and One-Flowered, and in the last week of June I always go to see the Orchids.

The showy Ladies' Slipper grows in a sphagnum swamp that extends for a couple of miles along the base of the hills on the west side of the river at Glen Morris. It is hard to get at, and for anything else the damp sickeneing heat and the hosts of mosquitoes would keep me away. Old clothes, rubber boots, and a cap tied down over the ears are indispensable, for it is necessary to bore one's way through an entanglement of ancient cedars and tamaracks, over quaking bogs and masses of Skunk Cabbage and Marshmarigold leaves, Torn, splashed, hot, and mosquito-bitten, at last I reach the tall dead tamarack that marks the secret spot. On the rotting rails of an old decayed fence, the Sundew holds out rosy, dew-tipped fingers, and Pitcherplants, with pitchers half full of water, snuggle in the moss. Some years they are in blossom, but usually the maroon-coloured sepals have fallen and only the green saddle is left. At last, by a clump of tiny tamaracks, a white cross gleams, and below it hangs the slipper like a white shell, veined and spotted with pink and purple. Always I stand breathless before the Queen Flower of the swamp, then wander on enchanted from clump to clump of the great orchids and worship the glory hidden in the depths of the swamp. The flowers are always perfect. One year, however, I was horrified to find the slipper eaten away, and to discover snails at this work of desecration.

On the edges of this swamp, I have found the smaller and larger Yellow Ladies' Slipper, but have never seen the Moccasin Flower growing. People bring specimens to Galt from a swamp near Kitchener, but will not betray the locality even to one who never plucks an orchid.

The Rein Orchis grows here, too, but its spikes of greenish flowers are overlooked in the quest for the Ladies' Slipper. The curved spirals of Ladies' Tresses are found among the stones on the river banks, and along paths through the pine woods I find Rattlesnake Plantain. Once I found Rose Pogonia growing by an old cedar stump in a bog, but it has never appeared again, although I have looked for it every year. The Showy Orchis grows

in a quiet wood on the west bank. The first time I saw it the plants were all in bud, and, not knowing what it was, I dug one up and took it home. When the buds opened I felt sorry for the plant, whose chance to grow on year after year I had destroyed. Another curious plant that I used to find in dark pine woods is the Indian Pipe. Its stem is white and is covered with waxy scales. It has a single flower with a gray, smoky-looking centre, and the plant turns black soon after it is gathered.

All summer long the pageant of flowers passes by, and every year there are more wonderful things to be discovered—new plants, new birds, fossils, mushrooms and insects. Then when at last the cold winds sweep up the Valley and all is grey and blighted except for the flash of Bittersweet berries, the rambler has happy memories of summer days to warm the cold months when the living things are asleep under snow.

NOTES ON POST-GLACIAL TERRACES ON THE EASTERN AND WESTERN SHORES OF THE GULF OF ST. LAWRENCE*

BY E. M. KINDLE.

THE principal sources of information concerning the Pleistocene beaches of Newfoundland are the papers of Murray, Daly and Fairchild. Murray[1] records the occurrence of elevated marine shells at three localities, the maximum elevation being 60 feet. The observations of Daly[2] relate to localities on both the eastern and western coasts of the island. Fairchild[3] has dealt with the whole subject of Post-glacial uplift in northeastern America and published a map showing by isobasic lines the inferred extent of Post-glacial continental uplift east of Hudson Bay and the upper Mississippi River valley, including emergence of the shoreline around the Gulf of St. Lawrence. This paper includes a letter from Tyrrell on the subject of Newfoundland Pleistocene shorelines.

Bell, Chalmers and Goldthwait[4] have contributed many details concerning the marine terraces about the shores of the Gaspe peninsula. Recent publications by Twenhofel[5] and Coleman[6] have contributed in a comprehensive way to our knowledge of the terraces on Anticosti Island and the southern shores of the Gaspe Peninsula.

During the summer of 1921 the writer made a short excursion inland from the Bay of Seven Islands, which is located west of Anticosti Island, and visited the estuary of the Humber river in western Newfoundland. The observations on Pleistocene geology made during the visits to these two localities on opposite sides of the Gulf will be recorded in this paper.

Through the courtesy of Mr. J. B. Tyrrell, F.G.S., observations made by him at Bay St. George and other points on the Newfoundland coast will be incorporated in the following notes.

Geological excursions which were made by the writer during a brief stay in the village of Curling near the western coast of Newfoundland resulted in finding marine fossils in an elevated Pleistocene sea beach near this point. The bearing of information of this character on the general problem of differential uplift appears to furnish an adequate reason for recording even isolated observations like the present ones.

Curling is located a few miles above the Bay of Islands on the steeply sloping south shore of the Humber River which here occupies a deep fiord valley called Humber Arm. Conditions have never been favourable for the development of striking or typical terraces at Curling. But a small apron-like terrace of gravel composed of slate fragments, is cut through by the railway about one mile west of the town. A thickness of eight or ten feet of this material is exposed in the cut. Along the sides of this cutting north of the highway crossing *Mytelus edulus* was found in the gravel. Several specimens of this shell were found but no other species was met with. The surface of this deposit is about 50 feet above the Curling railway station by aneroid. The elevation of the roadbed at the station is 79 feet above high tide mark according to the Engineering Department of the Reid Newfoundland Railway. The gravels with *M. edulus* are therefore about 129 feet A.T. No indications of a greater Pleistocene submergence than this were observed, but the absence of terraces at higher levels cannot be regarded as evidence against a somewhat greater maximum submergence.[7]

*Published with the permission of the Director, Geological Survey, Ottawa, Ont.

[1]Proc. and Trans. Roy Soc. Can., Vol. I, pp. 58-76, 1883.

[2]Mus. Comp. Zool. Harvard Univ., Vol. 38, Geol. Ser. No. 5, 1902; Amer. Jour. Sci., Vol. I, Ser. 5, pp. 381-391, 1921.

[3]Bull. Geol. Soc. Amer., Vol. 29, No. 2, pp. 187-234, 1918.

[4]12th Int. Cong. Geol., Guide Book No. 1, pt. I, pp. 81, 120.

[5]Amer. Jour. Sci., Vol. I, Ser. 5, 1921.

[6]Can. Geol. Surv. Bull. No. 34, 1922, p. 14.

[7]NOTE.—Daly gives 160′ for the highest shoreline at Curling; Amer. Jour. Sci., Vol. I, pp. 385-386, 1921.

Another old sea beach deposit is reported to have been passed through by a well in the town of Curling located on the property of Mr. Baggs. Seashells were found in digging the well, according to Mr. Baggs, at a level of about 40′ A.T.

In connection with the observations recorded above, Tyrrell's notes on the terraces of Bay St. George, 45 miles southwest of Curling, and points on the east coast of the Island are of interest. He writes as follows:[8]

". . . At Bay St. George, west of Stephenville, west coast, the main terrace has an elevation of 100 feet. At Fox Island River, north of Bay St. George, there is a well defined gravel beach at an elevation of 150 feet above the river. From this gravel beach an even plain rises gently and regularly to the foot of the mountains where it has an elevation of 600 feet above the sea. The plain is underlain by hard boulder clay and I could not distinguish any definite gravel beach or shore on the line which I travelled, but I would not say that it does not exist. I am reasonably certain that there is no shore line along the foot of the mountains at the 600 foot elevation.

On the west side of White Bay, east coast, there was an excellent opportunity of seeing the old shore lines on Sops Island where a depression between two ridges of rock is filled with boulder clay. On this Island there is a strong gravel beach at 120 feet, and another at 160 feet, but above that there is no sign whatever of a shore line or of wave action of any kind, though there are excellent places for preservation of a beach if any had ever been formed. I am therefore satisfied that the 160 foot beach is the highest post-glacial shore line on Sops Island.

On Sops River the glaciation was north-eastward down the river from the Long Range Mountains. I am not sure that there was not also a glaciation northward down White Bay itself.

In the vicinity of the City of St. John's, I did not measure the height of the highest shore line, but am satisfied that it is much nearer the 160 foot level than the 575 foot level as given by Daly."

It will be noted that none of the observations quoted above show beaches at a greater elevation than 160 feet. The higher figures in letter quoted by Fairchild[9] were estimates made evidently without instrumental aids which will explain any apparent discrepancies. The revision of Daly's earlier observations at St. John's[10] by himself has reduced the post-glacial emergence to zero.[11]

The very large figure given by some early observers for the maximum emergence on the Labrador coast have not been corroborated by the later work on that coast. The surprisingly large figure of 2000 feet reported by Bell[12] for the highest beaches at Nachvak Inlet in north-eastern Labrador has not been verified by the later observations of Daly and Coleman; the latter[13] gives 430 feet as the greatest elevation at which elevated beaches have been observed on the Labrador coast. The beaches reported by Hind up to 1200 feet in the interior of Labrador are doubtless modified glacial moraines as suggested by Packard.[14] Hind relied much upon the absence of boulders as a criterion of the amount of emergence as the following quotation will show: "The remarkable absence of erratics in the Moisie, until an altitude of about 1,000 feet above the sea is attained, may be explaind by the supposition that they may have been carried away by icebergs and coast ice during a period of submergence to the extent of about 1,000 feet."[15] This is about twice the elevation of any Labrador shoreline recognized by Daly.[17] It may be that late valley glaciers may have, in some cases, been responsible for removing the abundant and widely distributed boulders left by the continental ice sheet. This possibility makes the upper limit of boulders a criterion of doubtful value for estimating the total emergence when applied to coastal valleys. The highest shore lines observed by the writer on the Labrador coast are those at West Modeste, north of the Strait of Belle Isle, where two magnificent terraces are developed behind the village. The highest of these stands 500 feet A.T. according to Daly.[16]

Certainly none of the terraces seen by the writer near the twenty-odd fishing stations between Blanc Sablon and Indian Harbour approach an elevation of 1000 feet. The only terraces which the writer has been able to measure on the south shore of the Labrador peninsula are those north of the Bay of Seven Islands. The nine-mile railway from the Bay to Clarke City skirts the front of the highest of these for two miles or more. The lower terrace has a height of 155 feet according to a hand level measurement made by the writer's assistant, Mr. R. H. Wetmore. The terrace is composed of blue clay except the uppermost 20 to 30 feet, which is sand. The upper terrace, consisting exclusively of sand, stands according to aneroid measurement, 40 feet above the lower terrace. The town of Seven Islands, opposite the shore end of the nine-mile pulp-wood railway, stands on a sand flat barely

[8]Letter to the writer, December 20, 1921.
[9]Op. cit., p. 227.
[10]Bull. Mus. Comp. Zool. Harvard Univ., Vol. 38, Geol. Ser. Vol. 5, No. 5, p. 258, 1902.
[11]Amer. Jour. Sci., Ser. 5, Vol. I, p. 382, 1921.
[12]Can. Geol. Surv. Ann. Rept., Vol. I, 1885, p. 8 DD, 1886.
[13]Carr. Geol. Surv. Mem. No. 124, p. 47, 1921 ed.
[14]Mem. Bost. Soc. Nat. Hist., Vol. I, p. 219, 1867.
[15]Hind, H. Y., Can. Nat., 2nd Ser., 1, 302 (1864).
[17]Amer. Jour Sci., Vol. I, Ser. 5, p. 384, 1921.
[16]Op. cit. p. 384.

above high water mark, which represents the terrace last uncovered in the district.

Twenhofel[18] reports the highest terrace on Anticosti island observed by him to have an elevation of 442 feet. On the opposite side of the mouth of the St. Lawrence from the Bay of Seven Islands Coleman[19] found the terraces progressively higher toward the west, with a maximum elevation of 434 feet at Ste. Flavie. The 195-foot terrace at Clarke City may not represent the maximum emergence in that district. No higher terraces were seen, however, and it is inferred that the Bay of Seven Islands area and the Chaleur Bay region lie on opposite sides of a zone of maximum emergence which has an axis passing near the north shore of the Gaspé peninsula, through Anticosti island, to the north shore of the Strait of Belle Isle where Daly reports a terrace at 500 feet.

Coleman and Goldthwait agree in making the maximum emergence on the south side of the Gaspé peninsula less than half that on the north side. All of the data available concerning the south half of the west coast of Newfoundland place it in the zone of relatively low emergence.

[18]Amer. Jour. Sci., Vol. I, Ser. 5, p. 272, 1921.
[19]Can. Geol. Surv. Bull., No. 34, 1922, pp. 14-15.

BIDE-A-WEE LOON

BY MRS. E. J. BOAG

EARLY in July, 1922, the writer and family arrived at one of the small islands in Blue Sea Lake for a short holiday.

A pair of Loons had already taken possession of one end of the island. They seemed far more curious than perturbed at the arrival of the humans and would frequently come within ten or twelve feet of the shore, heads on one side, to inspect us.

After a few days of this mutual inspection, we suddenly remembered our camera and decided to try for a snapshot. We rarely saw both members of the pair of Loons at the same time, but were quite content to snap one. Unfortunately fate here played us an unkind trick. The appearance of our camera marked the disappearance of the sun for that day.

Next day I decided to try my luck again and, armed with the camera, went in search of the Loons. There was neither sign nor sound of them in their usual haunt, so, creeping slowly and cautiously, I neared the water's edge where it seemed their nesting place must surely lie. Still no sign of them; but from amongst the bushes near by a continual "*cheep, cheep*" and yet nothing moving except myself. Finally I located the spot whence came the "*cheep, cheep*," and there, amongst a few old twigs on levelled ground, was a large grayish-green egg with two large black spots on it. On creeping closer, I discovered that the two spots were portions of the Loon chick, visible through the broken shell.

By the side of this egg was a broken shell indicating that the first-born had arrived earlier.

It was about ten in the morning when I first discovered the egg and not till four in the afternoon did the little one finally emerge.

The parents were still absent, so I put some clam shells of water near the chick and left it, heartily wishing that its parents would come, as no doubt did the chick

We listened for them through the night; it was windy and stormy and not a sleep-inducing one. We heard their calls from an island to the south of us, but they did not come near us. In the morning I hurried off to see my foundling.

It was still alive but apparently weaker, and much bothered by the flies, so I made a little nest and brought it in this nearer to the house, where we could watch it better.

After it had been given a little stimulant it became decidedly chirpy and our hopes rose accordingly, only to fall later, as, towards evening that day the little victim of parental neglect gave up the ghost.

We could not leave it to the mercies of flies and ants and others of the insect world, so buried it deeply and erected a granite tombstone at the head of the grave, whereon you may read: "In Memory of Bide-a-wee Loon, Born July 11th. Died July 12th, 1922."

LICHEN GROWTH AND SNOW DEPTH

BY W. TAYLOR

I HAVE found in the course of observations made during the last few years that there is an apparent connection between the surface level of the snow which accumulates on the higher mountain slopes north of Vancouver, B.C., and the point to which the lichen *Usnea barbata*, or "old man's beard," descends on the bark of the trees in the alpine zone.

Systematic measurements here are limited to the

past three years; but earlier sporadic observations are in accord with them, the whole going to show that the average depth to which the snow accumulates on the levels above 3,000 feet can be obtained directly from the average lower limit of this lichen on the tree-trunks. Professor Church has shown that snow densities in the same geographical district at the end of the season of accumulation vary only about 10 per cent. A few determinations of density, or even an assumed density obtained from a nearby district of the same general altitude, taken in conjunction with the average limit of the lichen referred to, may not improbably afford sound information sufficient for the preliminary survey of watersheds.

Usnea barbata is a typical lichen, sub-alpine in character, foliaceous, with a length of about 9 inches, and a light green colour, which blackens with age. It has a fruticose thallus. It fruits in the fall, the fruit consisting of small circular discs about a millimeter in diameter. It entirely covers the trunks and branches of the host trees under favourable conditions. It ranges in altitude from 2,000 to 6,000 feet in the mountain district north of Vancouver. It is partial to open slopes, and does not favour thick stands of alpine timber. With the exception of the yellow cedar (*Chamaecyparis nootkatensis*) it attaches itself to all alpine trees in this district, including the western white pine (*Pinus monticola*), alpine fir (*Abies lasiocarpa*), white bark pine (*Pinus albicaulis*), and mountain hemlock (*Tsuga Mertensiana*).

The indications of snow depth from the height at which the lichen growth begins are unreliable below 3,000 feet on southern, and 2,500 feet on northern exposures. Some care and experience are necessary in obtaining a trustworthy average height at any point, as shade, exposure, age, and condition of trees give rise to differences which must be discounted in certain cases. But this presents no difficulty to an observer with some experience.

Between May 2nd and May 10th, 1921, which was the period of greatest snow depth on the northern alpine slopes here, measurements were made in different places between the 3,000 and 4,000 foot contours. *Usnea barbata* was found to begin 3 feet on an average above the surface of the snow layer. The difference of 3 feet remained constant in dense, thin, and open forest, on grades of varying steepness, and on level rock-benches. The snow depth at 3,000 feet, for example, averaged 8 feet, and the lichen grew to within eleven feet of the ground; at 3,500 feet the snow depth was 15½ feet, and the lichen grew on the trunks to 18½ feet from the ground, while at 4,000 feet, with a snow depth of 21½ feet, the lichen grew down to 24½ feet. This difference of 3 feet between the snow depth and the lichen limit was not departed from at any of the 200 or more trees where the measurements were taken in the first week of May, although the trees presented great variations in species, size, aspect, and altitude.

It is not possible as yet to decide whether the limit of the lichen marks the ordinary maximum depth of snow, the average depth, or a constant difference. The depth of snow on the northern mountains in May, 1921, was about 3 feet less than what is probably the average depth taken over a long series of years, though this greater depth has only been reached once in the last nine years. The very slow growth of the lichen might, however, make it independent of even such slow seasonal changes as this, in which case the beginning of lichen growth may correspond to the average snow depth. But the point seems to be of sufficient practical importance to justify an appeal at this stage to other observers, especially in view of the cosmopolitan character of this lichen. It might also be worth while to direct attention to other species of lichens whose distribution is more limited.

AN INVASION OF COOTS

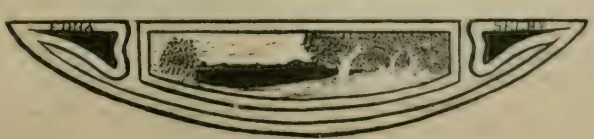
By J. A. MUNRO.

LATE October usually sees a gathering of Coots at various points on Okanagan Lake. These bands, sometimes numbering a thousand or more, remain until spring, feeding over the beds of *Potamogetons* unless a particularly severe cold snap causes ice to form over their feeding grounds when they move south until open feeding grounds are reached. Although rarely shot at or disturbed they are usually on the alert and will not allow a close approach. Until this winter I had noticed fearless coots on only one occasion. This was at Summerland in the latter part of March, 1918, when a flock of forty were observed feeding over a wide mud flat on the lake shore close to the main street of the village where automobiles and wagons were constantly passing. These birds did not even raise their heads when a vehicle or pedestrian passed within a few yards.

Conditions during the past winter were quite different. There was an *invasion* of coots and when the cold weather came in February, a steady cold that lasted without interruption for six weeks, these birds, contrary to their usual custom, did not move south. "Mud-hens" were reported in large numbers from Kelowna, Summerland and Penticton on Okanagan Lake, from Kalamalka Lake, four miles to the east and from Shuswap Lake, fifty miles north. At Okanagan Landing they were so abundant as to consume practically all the available duck feed; the long stems of *Potamogeton perfoliatus* were stripped of all their leaves with the regrettable consequence that the usual large bands of Redhead did not winter. With the cold weather, ice formed for some distance out from the shore, covering much of the already partly exhausted feeding ground. The coots were in a sad plight. Large numbers gathered along the icy shore by the village where they were fed scraps by the children. These birds became very tame and would come to be fed when called. Indeed, one small girl was so regular with her largess that the bolder birds would scramble into her lap for morsels of food. Sometimes birds froze to the ice during the night in front of the houses of their benefactors and these had to be thawed out with hot water the following morning. The birds that were fed apparently depended entirely on charity for their sustenance and suffered more than those which had not been pauperized. These led a relatively happy existence diving in thirty feet of water for a scant supply of food. When the weather moderated and the ice melted along shore it was expected that the coots would revert to their normal suspicious attitude towards all things human. However, this was not the case. They continued coming for scraps and many spent the entire day walking along the beach or paddling about in the shallow water close to shore. Several small jetties beside the houses on the lake-shore always held their quota of coots, resting placidly in the sun during the intervals of preening. One band accompanied by several scaups was always to be found close to the Canadian Pacific Wharf, and when the boat arrived, usually at eleven a.m., they gathered alongside to wait for scraps and when the deckhands threw out the remains of their lunch the ensuing scramble was a source of endless amusement to the onlookers. Coots walked along the railroad track beside the boat landing in perfect indifference to the crowd of passengers transferring from the boat to the train, and on several occasions it was necessary to drive them out of the waiting-room. Many birds walked some distance from the water across the frozen meadows at the north end of the lake and others explored the sage brush benches on the west shore. These were "wild" birds and their overland journeys were an indication of the food shortage in the lake.

When Kalamalka Lake froze over in February an excited resident telephoned the Chief of Police that thousands of Mud-hens were dying and "What was he going to do about it?" The wretched birds moped on the ice or floundered about in the deep snow when the last piece of open water closed up and a great many perished. Those that were not too weak or too coated with ice to fly left the frozen lake in the night. A number of these were seen in Vernon about ten p.m., where, bewildered by the lights, several flew against shop windows and one bird ended its career in a public garage.

Conditions at Shuswap Lake were much the same although posssiby the casualties were higher. While waiting for a south-bound train at Sicamous Junction on February 24th I walked along the railroad track with the Provincial Police Constable to see the Coots. There was a small area of open water some distance from the beach where a few birds were feeding, but the majority were gathered about the boathouses on the beach or standing in the snow. These had been fed regularly and apparently made no attempt to shift for themselves. When the constable called *"Coot, Coot, Coot,"* they came flying towards him, their great clumsy feet dragging in the snow. A month after I was again in Sicamous and the constable informed me that few Coots had survived. A number of Mallard and Scaup also died during the winter in spite of regular feeding by the Sicamous residents. I was told by a resident that three Mallard frequented his back yard where he was in the habit of feeding them, and after a short time, tamed by cold and hunger, they entered his kitchen fearlessly when allowed to do so. It was estimated by several that five hundred Coots and two hundred ducks, chiefly Mallard and Scaup, had succumbed to the combined effects of cold and starvation during the month of February. It is difficult to understand why these birds did not migrate at the first indication of zero weather, when a flight of fifty miles would have brought them to open water and comparative safety.



LARVÆ OF *PHORMIA CHRYSORRHEA* MACQ. FOUND UPON NESTLING BLUEBIRDS

BY HOYES LLOYD

ON July 4, 1922, Philip Foran and I discovered a Bluebird's nest at his farm five miles west of Hull, Quebec. The nest was in a cavity in a dead stub and was situated about five or six feet from the ground. At this time the nest contained four eggs.

I returned to this nest on July 23, and found the young fairly well grown and feathered. Consequently they were removed from the nest and banded. Two of the four had enlarged tarsi—perhaps twice normal size as indicated by the tarsi of the other two.

This enlargement may have been caused by the presence of fly larvæ which were found attached to the tarsi. These larvæ clung tightly to their host, but when pulled off moved about with agility.

On the next day, July 24, a return visit was made to the nest and all the young were searched carefully for these parasites. Ten were secured, which with the three taken the day before, made a total of thirteen from the four birds.

The larvæ were found on the tarsi again, one on a lower mandible, several between the growing quills on the under side of the wings, and one was attached to a growing quill. Under the birds' wings tiny spots of blood were seen where the larvæ had been attached.

Eleven live larvæ were forwarded to the Entomological Branch, Dominion Department of Agriculture, and fortunately they succeeded in rearing three to maturity. Their report on the matter is as follows:—

DEPARTMENT OF AGRICULTURE
ENTOMOLOGICAL BRANCH
Ottawa, August 18, 1922.

Mr. Hoyes Lloyd,
Dominion Parks Branch,
OTTAWA.

Dear Mr. Lloyd:—

In reference to the maggots which you found on nestling Bluebirds, I have much pleasure in informing you that we were successful in rearing three adults from the material you supplied. Dr. Aldrich of the U.S. National Museum, to whom the specimens were sent identified them as *Phormia chrysorrhea* Macq. On referring to Dr. Aldrich's catalogue of the Diptera I find that this genus commonly is found on the young of birds. The species *azurea*, for instance, is found in France and Germany on the nestlings of Sparrows and young Larks, whereas *chrysorrhea* has been taken in Germany on young Swallows.

We have little information or the nature of these insects in our offices; most of the references apply to European literature, it being stated that both these two species are rare in North America.

On behalf of the Branch I wish to thank you very much indeed for your kindness in drawing our attention to this insect and for submitting specimens. I hope that the information contained in this letter will prove of interest to you.

Yours very truly,
R. C. TREHERNE,
Chief, Division Field Crop and Garden Insects.

As the nest was empty on August 1, and as Bluebirds were seen in the vicinity, it is probable that the young were not permanently disabled by the parasites, and were able to fly at the usual time.

My thanks are due the officers of the Entomological Branch for their courteous attention to this matter.

OCCURRENCES OF THE MEADOWLARK IN NOVA SCOTIA

BY HARRISON F. LEWIS.

MANY of the occurrences in Nova Scotia of the Meadowlark (*Sturnella magna magna*) have not been recorded in any publication. Such records of occurrences as have been published are widely scattered. It has therefore seemed advisable to collect as many records of Nova Scotia Meadowlarks as possible and to publish them in one article, where they may be referred to readily.

The endeavour to collect these records has resulted in the list, given below, in which fourteen Meadowlarks are definitely recorded from Nova Scotia. In the compilation of this list valuable

assistance, which is gratefully acknowledged, was received from Mr. Harry Piers and Mr. P. A. Taverner. The writer would be pleased to learn of any occurrences of the Meadowlark in Nova Scotia which are not included in this list.

1. (Date?) "Very rare. Only a mere straggler. One was shot at Stewiacke."—Downs, A., *Birds of Nova Scotia*, Proc. & Trans., N.S. Inst. of Sci., Vol, VII, p. 166. Halifax, N.S., 1888.

2. A female, much wasted, [was] taken alive by Mr. Flemming, of Sackville, Halifax Co., N.S., Feb. 16, 1889.—*M.S. Notes of Harry Piers.*

3. T. J. Egan got one from Prospect, Halifax Co., N.S., in May, 1890. It was a male.—*M.S. Notes of Harry Piers.*

4. "On Oct. 24th, 1895, a Meadowlark was obtained by Mr. Dickie, of Canning, Kings Co., [N.S.]. The bird is very rare in this province." Piers, Harry, *Notes on Nova Scotian Zoology, No. 4*, Proc. & Trans., N.S. Inst. of Sci., Vol. IX, Pt. 3, p. 261. Halifax, N.S., 1897.

5. A Meadowlark in winter plumage in the Nova Scotia Provincial Museum was taken, according to the label attached to it, at Lawrencetown, Halifax Co., N.S., Oct. 21, 1901.

6. "Meadowlark (*S. magna*) taken at Eastern Passage, Halifax, [N.S.], 28 April, 1905."—Piers, Harry, *Report of the Provincial Museum of Nova Scotia for 1905*, p. 7. Halifax, N.S., 1906. This specimen, which is preserved in the Nova Scotia Provincial Museum, is in breeding plumage.

7. "One taken at Comeau's Hill, Yarmouth Co., N.S., in fall of 1908, Allen, E. Chesley, *Annotated List of Birds of Yarmouth and Vicinity, Southwestern Nova Scotia*, Proc. & Trans., N.S. Inst. of Sci., Vol. XIV, Pt. 1, p. 84, Halifax, N.S., 1916.

8 & 9. Two seen at Weymouth, N.S., Feb. 23, 1911.—Sanders, G. E., *Ottawa Naturalist*, Vol. XXV, p. 104. Ottawa, Ont., 1911. One seen by Sanders at Weymouth on Feb. 26, 1911, and recorded under the reference given above is presumed to have been one of the two seen Feb. 23.

10. "Another at Emerald Island off Shelburne Co., Feb. 20, 1912. This was said to be one of three or four on the island at the time."—Allen, E. Chesley, *Annotated List of Birds of Yarmouth and Vicinity, Southwestern Nova Scotia*, Proc. & Trans., N.S. Inst. of Sci., Vol. XIV, Pt. 1, p. 84. Halifax, N.S., 1916.

11. A male Meadowlark in breeding plumage in the Nova Scotia Provincial Museum was taken, according to the label attached to it, at Eastern Passage, Halifax Co., N.S., Jan. 30, 1914.

12. One was taken [by R. W. Tufts] at Bout Island, near the mouth of the Gaspereau River, Kings Co., N.S., Jan. 7, 1916.—Tufts, R. W., *Notes on the Birds of the Grand Pre Region, Kings Co., N.S.*, Proc. & Trans., N.S. Inst. of Sci., Vol. XIV, Pt. 3, p. 182. Halifax N.S., 1917.,

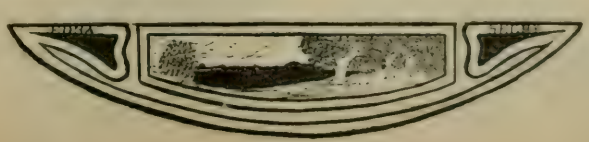
13. A Meadowlark was observed about the Citadel, in the city of Halifax, N.S., on several successive days during the last week in March, 1917, by the writer.

14. A Meadowlark was observed clearly at close range, with X6 binoculars, in a field near the border of a salt marsh, at Central Chebogne, Yarmouth Co., N.S., on Dec. 2, 1921, by the writer. It was in company with a small flock of Robins and a Flicker.

All of the records given are from the central and western parts of Nova Scotia. There are seven winter records, three spring records, three fall records and one record for which the season is unknown, but no summer records. It is evident that the Meadowlark occurs in Nova Scotia only as a straggler.

The bird (No. 13) observed by myself at Halifax, N.S., in March, 1917, was certainly a Meadowlark, but I am in doubt as to whether it was an Eastern or a Western Meadowlark. My attention was first attracted to the bird by its song, which was somewhat like that of the Robin, but which I realized was a song unfamiliar to me. I was at that time already very familiar with the song of the Eastern Meadowlark, but I have never met the Western Meadowlark in the field. Passers-by who heard the song of the Meadowlark at the Halifax Citadel, were heard to remark, "Listen to the Robin." When I finally obtained a good view of the bird I was astonished to see that it was a Meadowlark. The idea that it might have been a Western Meadowlark did not occur to me until some time afterwards.

I have examined carefully the three specimens (Nos. 5, 6, and 11), preserved in the Nova Scotia Provincial Museum, and have found them all to be Eastern Meadowlarks (*Sturnella magna magna*).



BOOK REVIEW

SOME USEFUL AUSTRALIAN BIRDS. *Walter W. Froggatt.**—It is of great interest to those on this continent who are endeavouring to further the cause of Wild Life Conservation to learn of the similar activities of our enterprising brethren in the Antipodes. The publication treated here should go far to create an interest in the birds and it is obviously impossible to protect them without that interest. This work is profusely illustrated with copies of the figures in Gould's *Handbook of the Birds of Australia*, reproduced by the three-colour process, and this alone should serve to extend the value and influence of the work to both young and older readers. The illustrations are placed through the text, certainly a more convenient plan than having them all bound in at the back of the book and thus separated from the related text on each species.

After a preface concerning this publication and its forerunners, there is an Introduction of fifteen pages. The writer considers that the protection of the native fauna must start from an economic basis, and he shows that once this is appreciated the sentimental reasons for protection will receive sympathy. The danger of protecting injurious species is given mention.

A resume of the history of bird protection in Australia is given under a general heading and under sections relating to the work of protection societies and to the influence of literature. The present protective act is said to give complete or partial protection to all birds or animals not blacklisted. The law includes a description of all sanctuaries. For enforcement, dependance is placed upon police officers and honorary rangers. Bird protection among the school children is furthered by 'The Gould League of Bird Lovers," founded in 1910. "It was John Gould who did in Australia what Audubon had done in America," and it is indeed fitting that both great ornithologists should have their names kept green by bird conservationists

There is then a chapter devoted to the administration of protective measures. Lessons are drawn from experiences and practices in the United States and Hungary, where, it will be remembered, the Central Office for Ornithology was ordered by the Minister in 1906, to present a scheme for the supply of nest-boxes to the State forests, comprising 5,000,000 acres. The author is hardly accurate in saying that the United States and Hungary are the only two great agricultural countries that have taken up the protection of birds in a practical manner. The Province of Canada passed an excellent law entitled "*An Act for the Protection of Insectivorous Birds, and Others Beneficial to Agriculture*," in 1864 (Chap. 52, 27-28, Vict.) and the Province of Ontario passed a valuable law entitled "*An Act for the Protection in Ontario of Insectivorous and Other Birds Beneficial to Agriculture*" in 1873 (Chap. 45-36, Vict.). Further, in educational work, Ontario was far advanced twenty years ago. The publications of Mr. C. W. Nash in this connection can hardly have been known to the writer of whom we are speaking. In 1904 the third edition of his *Birds of Ontario in Relation to Agriculture* was published, and he is still actively engaged in bird conservation work after more than half a century's devotion to this cause. Other Provinces in Canada have also been active and Ontario is referred to particularly, because past conditions here are more familiar to the reviewer, and because it is one of the older Provinces.

It is odd to find a bird writer in 1921 referring to a few isolated flocks of Passenger Pigeons nesting in the Michigan woods—a statement that is at least thirty years out of date.

Reference is made to the history of bird protection in other countries; Germany, Austria, Hungary and Great Britain are referred to chiefly in this connection.

The usual arguments are advanced in favour of the creation of bird sanctuaries. Prominenece is given to the Yellowstone Park in connection with the preservation of the Buffalo—Canada and its Buffalo are not mentioned, although the greatest herd of Buffalo in the world is here. There were more than 6,000 individuals in this herd at the time of the last count. Nor is mention made of the enormous areas of wild life sanctuaries in Canada, the significance of which, in furthering wild life conservation is scarcely appreciated.

It is enough to cheer the hearts of bird lovers and ornithologists the world over, however, to read of the great steps under way to preserve the wonderful fauna of the Australian Continent. This gains new significance when it is remembered that our sister Dominion has now the mandate for great areas outside Australia proper, including Papua and a portion of Polynesia.

Under migration, there is much of interest concerning the Australian area and allied questions

*Department of Agriculture, New South Wales. *Some Useful Australian Birds.* Walter W. Froggatt, F.L.S., F.E.S., Government Entomologist; President, Royal Zoological Society, N.S.W.; Vice-President, Wild Life Preservation Society; Vice-President, Gould League of Bird Lovers; Vice-President, Field Naturalists' Society, N.S.W.; President, Wattle Day League. Price 10s. 6d. Sydney: William Applegate Gullick, Government Printer, 1921. 8vo., pp. 81, 62 coloured plates.

elsewhere. Mention is made of the Migratory Birds Convention in force on this continent.

"The effect of changing environment on the habits of birds" is of special interest with reference to the Australian fauana. Finally we have a discussion of the question of Introduced Species, surely an interesting problem from the Australian stand-point.

Under the groups:

"Birds of the Garden, Orchard and Field,"

"Birds of the Forests and Brushes,"

"Birds of the Inland Plains, Swamps, Open Forests and Scrubs," our author gives an interesting account of the sixty-five species treated. The text does not give descriptions of these, but does furnish attractive life history notes, anecdotes and points concerning distribution.

The book should serve its purpose admirably—namely, to teach about birds and thereby encourage their protection. It will give a good idea of the avifauna of this distant continent to those whose interest in birds is wider than our own confines.—H.L.

NOTES AND OBSERVATIONS

MUTILATED TAILS.—Mr. Johnson's remarks in the March *Naturalist* on the Red Squirrel that had lost a leg recall another interesting fact noted at the same Kapuskasing camp. There were a rather unusual number of Chipmunks (*Eutamias*) on the rocky little peninsula in the river where the camp was situated. A remarkable number of them had lost more or less of their tails. At the time we wondered what might be the cause of this but could arrive at no very satisfactory explanation. Traps seemed the most likely cause, but we could think of no fur trapping in the neighbourhood likely to cut off chipmunks' tails.

The summer of 1920, however, at Last Mountain Lake, Sask., produced evidence that may have a bearing on the subject. A number of Bush Gophers, Franklin's Ground Squirrels (*Citellus*) inhabited the vicinity of our camp and soon became very tame, running around about our feet under the table, over our persons, and up on the table itself. Though perfectly familiar with us, they showed the utmost atagonism towards each other and fought whenever they met. The largest and oldest buck of the community badgered the smaller ones unmercifully. Mr. C. H. Young, one of the party, describes an episode wherein this big fellow crept up on an unsuspecting victim from behind and, suddenly pouncing upon his tail, bit the end clean off. After the fracas, Mr. Young picked up the piece of amputated tail from the ground where the victor had dropped his trophy.

I have seen a number of other stub-tailed Bush Gophers since then and it seems to be a not uncommon result of these struggles for territorial supremacy. Such competition would be more intense in thickly populated stations and probably as great between Chipmunks as between Bush Gophers. Probably the mutilated Chipmunks at Kapuskasing were the vanquished of similar interspecific fighting.—P. A. TAVERNER.

ARCTIC THREE-TOED WOODPECKER (*Picoides arcticus*) IN OTTAWA IN SUMMER.—On August 28, 1922, while I was crossing Carling Avenue where it lies between the city and the Experimental Farm at the head of Fairmont Avenue, an Arctic Three-toed Woodpecker flew over into the sixty-foot border of high trees just within the Farm, having come, probably, from the woods still remaining within the city just across Carling Avenue from the grounds of the Dominion Observatory. As it flew into the border it uttered a harsh *K-r-r-e-k*. In a few seconds it was inspecting the limbs and trunks of some tall young pines, pecking energetically at the flakes of bark in search for the enemies of the trees. I observed it closely with and without binoculars, at one time within fifteen feet. The unbroken blue-black back, the bars at the sides, the long white streak under the eye and down the sides of the neck, the small narrow white streak back from the eye, the white under parts and even the three toes were carefully noted, while the absence of yellow on the crown indicated a female. In five minutes, again giving the harsh call, it flew back into the city towards the woods down Gwynne Avenue. I was astounded on seeing the bird, and am delighted to record herewith a summer appearance of this Woodpecker in Ottawa.—RALPH E. DELURY.

ADDITION TO THE CANADIAN FLORA *Cephalanthera oregana* REICH.—One lone specimen of this species was found, July, 1918, one mile north of Agassiz, B.C. It was growing in shade on a low hill covered with birch and bracken, southern exposure, in Humid Transition formation. Identified by Dr. C. V. Piper, Washington, D.C.—R. GLENDENNING.

TOM—THE TAME LYNX.—Some eight or ten years ago, I was in St. Flavais, Quebec, and happened to visit the barber shop. One of the two chairs seemed to be vacant, but on my going over to it, a Lynx was found curled up in it.

The Lynx was probably a year old and full grown, I should judge. He was every bit as tame as a domestic cat, liking to be petted, and purring loudly when pleased. He enjoyed being stroked on the chin, but when he stretched out his fore-legs and expanded his massive paws, one at a time, showing his claws to their full extent, while he was seated on my lap, I sat remarkably still.

All the dogs of the village ran away at the sight of Tom.—E. G. WHITE.

CERULEAN WARBLER (*Dendroica cerulea*) NEAR OTTAWA.—On May 14, 1922, as I entered the tall hardwood bush beyond Manotick, about 22 miles along the Prescott Highway from Ottawa, I heard at a distance of about 80 yards a Warbler's song new to me. I hastened through the woods and found the songster moving about in the tops of high basswood and beech trees. The song was fairly loud and required about three seconds in delivery. It was written down as—*zee-zee-zee-zee-zee—tah-ree*, the five uniform *zee*'s requiring half the time. The *tah* was lower and the *ree* higher in pitch than the *zee*'s. As the leaves were not fully developed, I was able to make a thorough observation of the bird with the aid of 8X binoculars. Almost immediately the narrow bar crossing between the pure white throat and the white breast was seen and then the other markings of the Cerulean Warbler were observed: the two white wing-bars, the white edging on the tip of the tail, the two or more dark lines down the side under the edge of the wing, a light strip over the eye bounded by a dark line on the edge of the crown, one or more dark lines on the back near the wing, and at times the bluish upper parts were glimpsed—especially when, on two occasions, the bird swooped down to lower levels, chasing a Black and White Warbler. With the male were one or two females moving about in the same manner and having the characteristics of the female Cerulean as nearly as I could determine. The rarity of the record led me to make a most thorough examination of the bird at intervals for over an hour, at noon in bright sunlight, and the bird sang on during the afternoon in nearly the same part of the woods. The plate by Fuertes in Eaton's *Birds of New York* depicts the bird as I observed it, while descriptions of the songs quoted by Chapman in his *Warblers of North America* are very like my remembrances of the song. There can be no doubt about the record—new to me, as apparently it is to the Ottawa district. However, it was a mere accident that I visited this woods, and I cannot but feel that the Cerulean Warbler would be found more frequently if searched for diligently.—RALPH E. DELURY.

GOLDENEYE BREEDING NEAR OTTAWA.—An adult female Goldeneye with four half-grown young was observed on July 22, 1922, on the Ottawa River, at the edge of the marsh above Cumberland, at a point 16 miles by canoe below Ottawa. The young were closely grouped about the mother, who floated low in the water, hoping to escape detection. As the canoe quietly approached them they increased the speed of their swimming away from the marsh. They were closely observed with the aid of 8X binoculars and were approached to within 100 feet, when the mother with broken squawks plainly told the young to "beat it," and being well schooled, they promptly did so, with wings and feet making good speed away from us and circling back behind us to the marsh. The old bird fluttered above the young, between them and the canoe, squawking signals continuously. The young appeared very dark above, with light edgings on the sides and eyes. The old bird was more closely observed, having the large brown head, short neck, thick dark body, white edging patch on wing and "golden" eye. The bill seemed indented above about one-quarter of its length from the tip. It is highly improbable that it could be other than the American Goldeneye. Adult and juvenile American Goldeneye were seen by the writer during August and September, 1903, at Go Home Bay, about 17 miles up Georgian Bay from Penetanguishene. These are the only two instances of the breeding of this species in Ontario that he has observed. Eifrig's 1910 list does not note the breeding of the Goldeneye in this district, and apparently the present is the only record of young Goldeneyes for Ottawa, though I understand from Mr. Hoyes Lloyd that a breeding female has been taken.—RALPH E. DELURY.

ADDITION TO THE FLORA OF CANADA.—A fruiting specimen of an unknown shrub was sent to the writer in July, 1922, by Mr. G. Fraser of Ucluelet. The plant is *Myrica californica*, California Myrtle, a relative of the Sweet Gale, *Myrica Gale*, and, so far as catalogues show, has not been recorded from Canada before.

Mr. J. W. Thompson, of Tofino, Clayoquot Sound, reports that the shrub was first discovered on his property, about four miles from Tofino, by Mrs. Thomas McBey of Cameron Lake, in September, 1920, and that it has a very limited distribution so far as known.

A good description with illustrations may be found in Sudworth's *Forest Trees of the Pacific Slope*, p. 209, figs. 83, 84.—C. F. NEWCOMBE.



QUEEN CHARLOTTE ISLAND WOODPECKER

Dryobates villosus picoideus

The Canadian Field-Naturalist

VOL. XXXVI OTTAWA, ONT., OCTOBER, 1922. No. 7

SOME NOTES ON THE SOOKE FORMATION, VANCOUVER ISLAND, B.C.

By Ira E. Cornwall, F.G.S.

ALONG the southwest coast of Vancouver Island several exposures of Tertiary sandstone are known, representing at least two formations. One of these, the Sooke formation, is exposed at several places between Becher bay and Sombrio river. The largest area of this formation lies in the basin drained by Tugwell, Muir and Kirby creeks, extending for about three miles along the coast. It faces the Juan de Fuca Strait, and has been traced for about three miles inland, where it has been found at an elevation of over 1,000 feet. It rests unconformably on the Metchosin basalts and Sooke gabbro. The sandstone is covered by a considerable thickness of Pleistocene glacial deposits, clays, sands and gravel. The general dip of these rocks is toward the shore, where wave action has cut into them forming cliffs, which at many places are undercut forming shallow caves.

The first systematic collection of fossils from this formation was made by Dr. C. F. Newcombe, of Victoria, in 1894 and 1895. Collections were also made by the Canadian Geological Survey.[1]

About half a mile west of Muir Creek the sandstone forms the beach and has been cut into small table-like projections, some of which are a few feet and others several yards in area. These are caused by the sea cutting through a thin, hard layer of sandstone lying on a softer layer, and are from six to twelve inches high. On the part of the beach uncovered only at the lowest tides are found the sea-urchins, *Strongylocentrotus purpuratus*, in cavities which they cut in the vertical sides of these tables. They do not cut deeply into the rock and become prisoners for life, as do some of the urchins on the California coast, but the holes are cup-shaped and just deep enough to cover them. According to A. Agassiz they cut these cavities with their teeth, gnawing at the rock as they incessantly turn around, thus enlarging the cavities as they grow. These little tables, or projections, are also honeycombed by the rock boring *Pholas penita*. These creatures commence their borings when very small and when they have once made a cavity they become prisoners, only their long siphons projecting from the holes. They cut into the rock by constantly turning by means of their foot which projects through a large opening between the anterior edges of their valves. It is the edge of this opening which does the cutting. or scraping, as the creature turns. When the *Pholas* has reached its full size this opening is closed by the growth of the shell. When broken, the rock is found to contain fossil mussels, *Mytilus* sp., in great numbers and in a beautiful state of preservation. There are also occasional leaf impressions, some of which show a reed-like leaf with three parallel longitudinal ridges, while others resemble oak leaves. In a piece of sandstone broken off from below low-water mark at the mouth of Sandstone creek, many of the cavities made by the *Pholas* were found crowded with the long shells of the rock boring *Adula stylina*, as many as six or eight being found in one opening. None of these shells were found in borings which they had made for themselves, but all in the borings made by the *Pholas* whose shells, in some cases, still remained in the holes. Evidently the rock in this locality is too hard for the *Adula* to bore into.

The writer has collected a number of fossil bones at different exposures of this formation, most of which were collected about four years ago from the cliffs and sandstone forming the beach west of Muir creek. Dr. Othenio Abel, of Vienna, has examined photographs and drawings of these bones, and, while unable to give an exact determination, has stated that they are from a species of small tooth whale. He also draws attention to the resemblance between one of the vertebrae and the lumbar vertebra of *Squalodont bariensis*, Jourdan,[2] from the Miocene of Bulluno in Italy. Another bone about eighteen inches long, he states, resembles, in cross-section, part of the lower jaw of a *Mystacocetan*. We have also found pieces of ribs, part of a scapula, and part of a small skull showing the ear opening. These specimens are too fragmentary to be of any real value, but they indicate what may be found in this formation by long continued search.

Considerable interest is attached to the finding of two *Desmostylus* teeth in the Sooke formation, both of which were collected in the cliffs between Muir and Kirby creeks. The first one was found in 1916, and is now in the B.C. Provincial Museum at Victoria. It was determined by the late Lawrence M. Lambe, of the Canadian Geological Survey, as the first right upper molar of the Sirenian *Desmostylus hesperus* Marsh, of Pliocene age.[3] The tooth is considerably worn, and the root is missing. It is composed of two longitudinal rows of appressed columns with a single column at the posterior end. Each of these columns shows the characteristic round pit in the centre. The length of this tooth is 34 mm.; width: 24 mm.: height of columns: 17mm.; diameter of largest column: 15mm.; diameter of smallest column: 10mm. The second tooth was found in 1921 in a large block of sandstone which had been dislodged from the cliff and had fallen to the beach. The number of columns and their arrangement is the same as in the first tooth, but the second tooth is larger and not so much worn. The length of this tooth is 46 mm.; width: 34 mm.; diameter of largest column: 24mm.; diameter of smallest column: 17 mm.[4] The root of this tooth is also missing, and the end column broken. The main difference between these teeth and the American and Japanese specimens is that each of the Sooke teeth has a well developed cingulum. There can be little doubt that these teeth represent an older species than *Desmostylus hesperus*, as recent research has shown that this formation is Oligocene in age, older than any of the formations in which *D. hesperus* has been found.[5] The only other species in the genus *Desmostylus* is *D. watasei* Hay,[6] from Japan.[7] This species is represented by one skull which was collected from sandstone situated some distance above a Miocene deposit. Taking into consideration the greater age of the Sooke formation, and also the presence of cingula on these teeth, they are, tentatively, named *Desmostylus sookensis* n. sp. The specimen in the B.C. Provincial Museum is the type specimen.

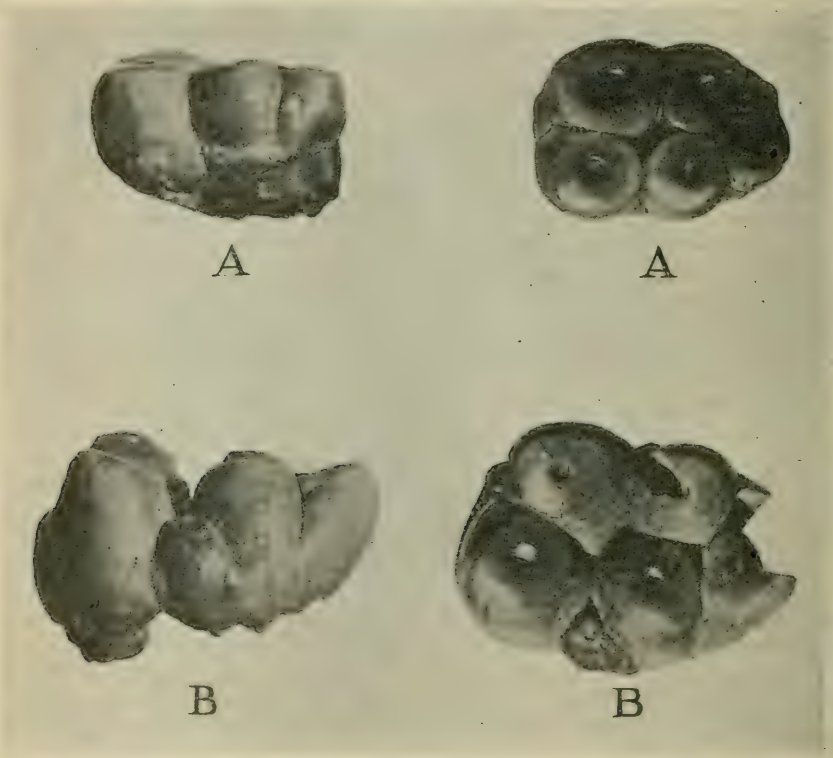


Fig. 1a.
Side and crown views of tooth of *Desmostylus sookensis* n. sp.

Fig. 1b.
Side and crown views of tooth of *Desmostylus sookensis* n. sp.

Since the first discovery of *Desmostylus* remains by O. C. Marsh in 1888, the exact systematic position of this little-known genus has been the subject of much discussion. Marsh described it as a sirenian, and it was later referred to the *Halicoridæ*.[8] In a paper by Dr. Othenio Abel read before the Vienna Academy of Science, he states, in part, "That *Desmostylus* belongs neither to the Sirenians nor to the Proboscideans nor to the Ungulates, and indeed is not a placental mammal at all!" He further states, "there can scarcely be any serious doubt left that in *Desmostylus* we have a marine herbiverous Multituberculate."[9]

On the east bank of Kirby creek and about half a mile from the shore the fossil beds are well exposed in the cliffs, Some of the shells from this locality have been determined by Dr. B. L. Clark as fresh, or brackish water species. Two of these are *Cerithidea newcombei* n. sp. Clark & Arnold, and *Goniobasis sookensis* n. sp. Clark & Arnold. A specimen of a very rare coral was also collected at this locality, and was determined by Dr. T. Wayland Vaughan as *Siderastrea vancouverensis* n. sp. This specimen is now in the American National Museum.

Another exposure of particular interest is at Sandstone creek, about three miles east of Jordan river. Here the creek falls over the cliff to the beach, making a fall of about ten feet. There are two more falls quite near the coast, one about a mile from the mouth of the creek and the other about a mile and a half. Below the falls the bed of the creek is covered with boulders washed from the glacial deposits through which the creek has cut. From the mouth of the creek to within a short distance of the first fall the water runs on the surface of the sandstone, which is uncut except for occasional pot-holes and little channels cut at lines of weakness in the sandstone. The two falls do not appear to have been caused by faulting, or by cutting back by the creek, but may have been the result of wave action forming cliffs when the land was at a lower level. This was partly confirmed by the finding of two wave-cut caves, one above the other. These are in the cliffs between Glacier Point and Sandstone creek. One cave is at the present sea level, and the other is about eighteen feet above it. The formation at this locality consists of alternate bands of coarse conglomerate and brown sandstone.

At almost all places where the base of the Sooke formation is exposed it is composed of conglomerate which rests on the eroded surface of the volcanics. We have only found fossils at one place in the basal conglomerates, which was on a small island in a bay about half a mile east of the mouth of Sandstone creek. Here we found specimens of *Acmaea geometrica* Merriam, and broken remains of *Ostrea* sp., and *Mytilus* sp.

As the Sooke formation becomes better known and more carefully worked it will probably be divided into different horizons, as there is a marked difference in the fauna collected from the different exposures.

As this coast is being rapidly cut away by wave action, and new material is thus constantly exposed it amply repays a visit each year. For several years Messrs. Connell, Downes and the writer have spent a few weeks each summer camping at different points along the coast and collecting specimens. Dr. Bruce L. Clark has kindly determined many of these for us, and some have proved to be new species. These will probably be described by Drs. Clark and Ralph Arnold in the Bulletins of the University of California Publications.

REFERENCES

[1]Clapp, C. H., Memoir 96, Sooke and Duncan Map-Areas. Geol. Surv. Can., No. 80, pp. 329-340.
[2]Dal Piaz, G., "*On Some Remains of Squalodont From the Miocene Sands of Bulluno.*" Palaeontographia Italia. Vol. VI, 1900.
[3]Lambe, Lawrence M., *Report of B.C. Prov. Museum*, pp. 42-43, 1916.
[4]Q.J.G.S., Vol. LXXVIII, part 2. No. 310, 1922.
[5]Merriam, John C., "*Notes on the Genus Desmostylus of Marsh.*" Univ. of Cal. Publications, Vol. 6, No. 18, pp. 403-412, 1911.
[6]Hay, Oliver P., "*A Contribution to the Knowledge of the Extinct Sirenian Desmostylus Marsh.*" Proceedings of U.S. National Museum. Vol. 49, No. 2113, pp. 381-397, 1915.
[7]Yoshiwara, S., and Iwasaki, J., Jour. Coll. Sc. Imp. Univ. Tokyo. Vol. 16, art. 6, 1902.
[8]Flower and Lydekker, "*Mammals Living and Extinct*". pp. 223.
[9]Abel, Othenio, "*Desmostylus, a Marine Multituberculate from the Miocene of the North Pacific Coast Region*". Abstract of the proceedings of the Vienna Academy of Sciences. 1922.

BLADDERWORTS OF ONTARIO

By F. Morris

MORE than twenty years ago, when I was just on the threshold as it were of a nodding acquaintance with the wild flowers of Ontario, I first discovered the showy blossom-spikes of the Larger Bladderwort (*Utricularia vulgaris*), while I was roaming along the shore of Lake Ontario near Port Hope; they were growing in great abundance on the surface of a small lagoon in the sand. The flowers were decidedly handsome and attractive. It was easy

to see on a near view of them that they must be close cousins to the Figworts (*Scrophulariaceæ*) with their two-lipped corolla subtended by a spur, and it lent added interest to the family to know that the lovely little Butterwort (*Pinguicula*), so familiar a feature of Scotch and English moorland bogs, was their next of kin.

The very same summer what might have proved a mere passing interest was made permanent by the discovery of a second species of these beautiful yellow flowers, a plant of much more delicate habit with a very slender graceful stalk and floating stems of fine-cut clean-looking foliage. I found it in the heart of a sphagnum bog near Newtonville, floating on a pool near some handsome spikes of the Prairie Fringed Orchid (*Habenaria leucophæa*) and surrounded by Pitcher Plants (*Sarracenia*), Beard Tongue (*Pogonia*), and Grass Pink (*Calopogon*). A goodly fellowship, to be sure, and yet, it seemed to me, it was well worthy of its company. I had some difficulty in identifying it, for the book of descriptions—to the tyro—of the Flatleaved Bladderwort and the Lesser Bladderwort are easily confused. It is certainly the former that I have found occasionally since, and I believe I was right in referring my Newtonville find to that species (*U. intermedia*).

In 1901 I went camping on the south shore of Lake Nipissing and in the sandy margin of a bay there, beside our tent, I discovered a very beautiful and highly fragrant spurred flower on a naked scape, which I took to be a bladderwort, but of bladders and even of roots there wasn't a trace to be found. I had no botany with me, and for over a month these specimens of the Horned Bladderwort had to lie hidden in my note book as a baffling mystery along with the Golden Hedge Hyssop (*Gratiola aurea*). Late that autumn I got Mr. James Fletcher, of Ottawa, to help me read these and other botanical riddles, notably one of two years' standing, the now widely distributed Least Toad Flax (*Linaria minor*). To have three kinds of bladderwort on one's calling list, so to speak, was a great satisfaction—childish, of course, but who of us does not envy the child his first meeting with every one of scores of earth's treasures?

More than fifteen years ago, when I paid my first visit to Algonquin, I was delighted to find both the Larger and the Horned Bladderworts abundant in the Park, and as I knew of several bogs near Port Hope where the Flat-leaved species grew, I felt I had always within my grasp that exquisite pleasure of the nature lover, second only to the pleasure of making new friends, that of renewing acquaintance with old.

And so matters stood till some five years ago, when I ventured, as an annual camper in Algonquin, to master the arts of paddle and portage. "All things come to him who waits", is true enough of the insects, birds and beasts that came to call at our camp on Cache Lake; but there is a race of beings held in durance vile by wicked enchantment. They may not go a-visiting, and these, alas! are the botanist's sole care, the flowers of the field.

Apart from the joy of exploring that the art of the portage provides, treading perhaps where human foot seldom if ever trod, there is this other lure, peculiarly the botanists', that round the very next bend he may make some new discovery in flowers. The very first portage I ever made in Algonquin—only one-quarter of a mile from Cache Lake—brought me what an amateur's vanity delights to think the discovery of a lifetime, a colony of Crag Woodsia (*Woodsia scopulina*), a fern hitherto known only from the Rocky Mountains; and here was I ten feet above level ground and only 100 miles from Toronto, staring at scores of the plants within a few rods of a beaten trail.

My second portage enabled me to cross a little beaver pond above White's Lake, and here in the black ooze of the margin left bare by the shrinking water of an exceptionally dry summer, I caught sight of hundreds of tiny magenta flowers on scapes less than three inches long. Here and there a deer had waded boldly through them to drink, but they fairly defied the foot of man to reach them from shore, or his canoe from the water. I managed at last to outwit these mocking imps with the long arm of a cedar pole, and, cutting off a few stragglers, brought my captives back in triumph to camp.

They were certainly a bladderwort, and, so far, to me a bladderwort had always meant a brignt yellow flower; I knew nothing of purple blooms in the genus. A careful study of Gray's botany showed that these tiny dull magenta blooms, set cross-wise on the top of their scape, their lower lip uppermost and the spur remote from the lips, must be the Reversed Bladderwort (*U. resupinata*). Here was a find, indeed; I was now on visiting terms with four species, two rooting in the mud, one purple and one yellow, and two floating in the water.

Next season was a very wet one and the ooze beds of *U. resupinata* were submerged all through August; but the disappointment was somewhat allayed by my finding both *U. vulgaris* and *U. cornuta* growing about the head pools and margin of this interesting little beaver pond.

In 1920, there was a great drought and by the middle of August I knew from the water-level on Cache Lake that a trip to the Beaver Pond would

be eminently worth while. Sure enough, on the farther shore of the pond were great patches of the tiny magenta blooms. After feasting my eyes on them, I came back to the nearer shore and made my way along the side towards the head of the pond; on my way I recognized with pleasure several old friends about the margin: the smallest of our Club Mosses (*Lycopodium inundatum*), the Yellow-eyed Grass (*Xyris flexuosa*), the little Green Wood Orchid (*Habenaria clavellata*), and the Long-leaved Sundew (*Drosera longifolia*). About half way up the shore, as I had anticipated, just out from the firm sandy margin, were dozens and dozens of this quaint little purple mud-dweller (*U. resupinata*). Passing these colonies I found myself presently among patches of that pretty yellow Crowfoot, the pigmy *Ranunculus Flammula*. I had grown so used to this flower that I hardly noticed its blooms, just taking them in with the tail of my eye as I moved along; but while clambering over a pine stump half buried in the sand, I noticed among them a little yellow blossom that somehow seemed different, whether in colour or in form it would be hard to say, but whatever it was it served to arrest my attention, so I knelt to examine the flower closely, and behold! there were two distinct little blossoms among these patches of yellow in the sand, and one of them was a bladderwort. It proved to be the Humped Bladderwort (*Utricularia gibba*); rarely more than one bloom on the scape and the scape not much more than two inches in length.

Last summer's (1921) tropical heat caused such unusual evaporation that at the end of July the watery coverlet had been snatched off these ooze beds, and their occupants roused for their brief revel a month or six weeks ahead of time. But there was no opportunity to do more than race to the landing of the Beaver Pond and back to camp for we were under promise to pack and set out on a week's trip with some friends—paddle and portage—about the Park. Our main course was to be down the Oxtongue to the High Falls and back; but before going south we were to spend two days paddling northwest to the centre of the Park, and here on the very first day of our trip awaited me the surprise of my life in the flowering line.

On Wednesday, August 3rd, we set out by canoe from Joe Lake Station on our way to Big Island Lake and the Otterslides. There were four of us in the party, a congenial couple from Florida in one canoe, and my wife and I in another. Soon after entering the creek above Little Joe Lake, our Florida friends who were just ahead of us sung out that among the large yellow Bladderworts so abundant at the sides of the main channel of Joe Creek were some purple ones. At first I thought that if the find was a bladderwort it must be the little Reversed species; but we were in deep, open water, and when I paddled up to the spot, judge of my surprise to find myself staring at a large handsome spray of flowers, as sturdy as the Greater Bladderwort and with a somewhat similar scape, three or four blossoms on each, but these, instead of yellow, a beautiful shade of violet, the lower lip having a spot of yellow on its face just forward of where the two lips met and a big stout spur jutting out below it. Long floating stems with crowded whorls of foliage lay in masses on the channel, the sprays of blossom so abundant as to give a kind of luminous haze or blush to the surface of the water.

A few specimens were stowed carefully away into a pocket plant-press, and there they remained for a week, buried (almost lost) under the thronging excitements of a canoe trip. These indeed were so many and great that I had time but twice to think of my find; once, between the Otterslide Lakes, where we discovered a large patch of *U. resupinata*; and again on the last day of the trip when we reached the Beaver Pond and our eyes fell on an army of the Reversed and the Humped Bladderworts drawn up on the margin, its cohorts all gleaming with purple and gold.

Reference to Gray showed that whorled leaves were found in one species only, *Utricularia purpurea*, and an examination of the last three editions of Gray revealed an enticing little problem. Fifty years ago the Purple Bladderwort was known on the Atlantic coast only; thirty years ago, records had been added from Lake County, Indiana; and some twelve years ago it had been reported from points in North Indiana and Michigan. It would be interesting to know in the first place whether the rapidly widening range of stations is due to the plant's activity or only to the activity of botanical research; I mean whether the colonies are newly planted or only newly discovered. In Algonquin the Purple Bladderwort has established itself in several large masses on both sides of the main channel of Joe Creek, and over a distance of about 100 yards, up and down stream. The colony must be at least ten years old, I should judge, and may be much older. If the colonies inland are newly established, it must mean that these plants have come to form the regular food of some water fowl and that their seeds are frequently borne to a distance on web, plumage, or bill (if not in crop).

The extant edition of Gray records it on the coast from New Brunswick to Florida, so it may have taken in the Atlantic Provinces; but I was told it was new to the Dominion; it is certainly

an addition to the flora of Ontario. Moreover, its delicate colouring and the beauty of its blossom make a strong appeal to the æsthetic eye; in short, it is an "accession" in far more than the Museum sense of the *hortus siccus*.

A NATURE LOVER'S CAMP IN NOVA SCOTIA

BY E. CHESLEY ALLEN

OUR camp fire had burned low. The occasional flare from some crumbling ember set strange uncouth figures struggling with each other upon the canvas of our tent, and drove back to the deep thickets the great shadows that had crept out to reclaim the little spot we had cleared for our summer home. The woods were still, but for the light splash of some furtive night fisherman along the lake shore, or the sleepy fragment of song from some small bird half aroused from its slumbers.

Suddenly from out over the star-lit bosom of the lake rose the long-drawn wail of the Loon; rose, and fell, and died away in receding echoes.

We had come here early in July, milady and I, to this little lake, where an obscure branch of the Tusket broadens out to meet the dense forest growth that clothes the ridges down to its very edge. But with the manifold and hurried duties of preparing a two months' camp before the darkness settled, we had not caught the true spirit of our surroundings until that wild cry came ringing over the water. For the cry of the Loon not only embodies all the freedom, vigor, and exultant passion of the wild life of the north, but is preeminently vocal of all the subtle warfare and relentless cruelty of the wilderness; and a fitting prelude it was to the pageant of wild life that we were to enjoy for the next few weeks.

Our camp lay by the shore of the lake, and at the foot of an old log-road that came down from the ridge above. Half way up the ridge this joined another rough road which wound through the woods to the settlement and our nearest neighbors, two miles above. Thither often we tramped, until every tree and shrub and stump claimed a corner in our memories.

Where the roads joined stood an old logging-camp, abandoned for two or three years, and already beginning to show signs of decay.

There is something about an abandoned logging-camp that invites inspection. The wild life that receded before the encroaching axe of the logger, comes back on his departure to take advantage of the artificial shelter afforded by his rough architecture. Swallows and wasps build under the eaves; bats fly at evening about the yawning doors and windows; and hares and shy wood mice take refuge under its floors.

This particular old camp would have afforded bats' wings enough to clothe Titania's entire train. One day, when we were passing, our attention was attracted by a scratching sound on the side of the building. Seeing nothing on the outside we entered; but there nothing was visible. Coming out again and locating the sound, we lifted a long loose strip of tarred paper with which the building was partly covered, and out flew bats in all directions. A snug hiding-place they had had clinging to the rough wall, with the noonday sun beating upon the black paper over them.

Just above our camp the road dipped into a dark hollow where the broad-leafed striped maples met overhead. Here on several mornings we found the ground strewn with moths' wings of a most delicate blue-green. The explanation was made clear one evening when we were returning to camp. Back and forth under the overhanging trees flitted the bats; and we knew that each quick turn and tack of wing meant the death of a moth.

By day the bats gave place to the dragon-flies The roadside swarmed with butterflies—admirals, swallow-tails, silver-spots, mourning-cloaks and sulphurs. Among these the dragon-flies were dragons indeed. Coursing up and down the road like a burnished steel shuttle, one would dart at a flitting butterfly, and quicker than the eye could follow, seize it, turn it over, and with its wings placed together keel-like, bear it off to some roadside twig, where in a moment the wings fluttering down showed that the meal had begun. These bold highwaymen were not above cannibalism, for they often seized and devoured members of their own family.

A great black and white hornet that came to our tent for flies, though not so sure of her mark as the dragon-flies, yet made many captures; and most of them were through the flies' own blunders. Entering our doorway she would dart at every dark spot upon the canvas, the flies in the meantime making feints at her, in the manner in which Swallows are often seen to do with larger birds. But, unlike the Swallows, the flies

often flew into the very clutches of their enemy, who caught many more in this way than by her own efforts. Each victim was taken to the ridge-pole of the tent, where the captor, hanging by one hind foot, deftly turned her victim over and over and clipped off its wings, and then made off with it through the doorway. The depository was not far off, for often she would be back within a minute, her lively hum blending with the high-pitched pipe of the cicadas.

Many other insect visitors, welcome and unwelcome, came uninvited to our tent.

A little mason wasp built her mud-walled nest in the corner of our packing-box book-case, but our clumsy fingers destroyed her dainty work before we were aware of its presence.

On the ground outside, however, we had an opportunity to observe the domestic economy of her cousin, a pretty little orange and black wasp. When first observed she was crawling awkwardly along dragging a green caterpillar; which, when the ground was rough, was almost too much for her. Following her laborious journey to a bit of smooth ground near an old dead stump, we saw her suddenly drop her burden and begin to circle about a small area a few inches in diameter.

Presently she stopped and began digging into the soft earth; and after excavating not more than half an inch, she quite surprised us by seizing her prey and completely disappearing with it into the ground. In a minute or two she reappeared alone, and began scraping the earth back into the pit, taking the greatest care to remove all hard lumps and bits of stone. In fact anything but the softest earth was carried away some few inches from her treasure-pit, which was finally levelled to the top, and the whole surface left smooth and free from rubbish.

After her departure we examined the spot; and, removing the freshly placed earth, found at the bottom of the shaft not only the green caterpillar, but beside it a brown one of about the same size, both capable of slight motion but helplessly paralyzed. Deposited carefully between them was an elongated white egg, from which eventually would have hatched a very hungry young wasp larva, ready to devour the food so wonderfully preserved and carefully placed at its disposal.

There is always a touch of mystery about those swarms of innumerable ants, which on certain sultry summer days emerge, and fill the air with the shimmer of their frail wings. For days the preparation for this great event has been going on under many a loose stone, or in many an old stump or soft hillock. But what manner of fiat is this that in some mysterious way goes forth throughout all the colonies far and near, and which calls forth their swarms as if by prearranged consent.

Throughout one lazy afternoon we witnessed the wedding pageant of the great caterpillar ants. Far and near the air was filled with their dazzling flight. One queen settled upon an old pine stump near our tent, and after a short survey of her surroundings evidently decided that it was the proper place for a home; for in that business-like way in which ants do everything, and as if to show her utter contempt for frivolities, she immediately set about ridding herself of her now useless wings. By a skillful use of her feet, the wings, first on one side and then on the other, were brought forward so abruptly that they were torn short off at the body; not bitten off as one might suppose.

To tell of all the insect wonders to be found about that woodland camp would take many pages. The strangely shaped chrysalids hanging on the thorn that developed into beautiful black and white admiral butterflies; the spiny galls on the witch-hazel from which the big yellow jacket wasps stole liquid sweets; the beautiful blue and green damsel-flies along the lake shore; the gay parties of silver-spots that danced about the roadside thistles; or the crafty ways of the caddis larva fishermen that stretched their nets in the current of the brook, all beguiled away those dreamy summer days.

But beneath the pleasing rustle of the forest leaves what an underplay of stealthy silent tragedy there is!

In a bank by the roadside a pair of Juncos had built their late nest. Perhaps some accident had overtaken their first attempt at rearing a family, for now in July the mother faithfully guarded her three speckled eggs. At last her vigil came to an end; and three limp awkward nestlings lay in the grass-lined hollow. Next day we visited the spot and found the young gone, and the grass lining strewn about the roadside. Suspicion rested upon the red squirrels who had been rummaging about the spot that morning.

Near our tent lay a large flat stone. A striped chipmunk scurrying across the clearing suddenly stopped and disappeared beneath its edge. The next moment a brown mouse appeared from the other side, and hurried away. Presently the chipmunk appeared bearing something in its mouth which he soon began to devour. Driving him away from his meal we found the head and feet of a young mouse. Another tragedy. But how quickly either squirrel or chipmunk seeks cover or cowers into rigidity when the deep boom of the big Horned Owl comes rolling over the tree-tops. Well do they know and fear the swift,

silent death that ever lurks to overtake the unwatchful among the forest people.

Our camp was in a paradise of birds. Birds were everywhere; on the ridges, in the meadows, up the brooks, and on the lake.

One morning the glassy surface of our cove was broken by long V-shaped ripples. The mother Loon had brought her young close in to the shore; and as we stepped from our tent a pretty sight they were; the snowy breast of the mother gleaming in the morning light, and the two black downy young paddling contentedly along in her wake. Out beyond watched the wary mate; and when we appeared both old birds sent long peals of weird laughter echoing across the waters, and started for the open lake followed by the two youngsters.

Now we dash for the boat. Well we know that the old birds can well laugh at any efforts of ours on the water. But what will these downy babies do? At our first sign of pursuit the male bird immediately dives. to reappear several hundred yards away. But the mother, though swimming some distance ahead of her offspring, remains in sight, and encourages their heroic efforts with loud wavering calls. And strong and steady pulling it takes to lessen our distance from the plucky little swimmers. When, however, it is shortened to a few yards, they separate, one following the mother's calls to the deeper water, the other keeping on up the cove. The latter we follow; and when our boat is almost upon him, flash! he is under. Relaxing our steady pulling to await his reappearance we are surprised to see his tiny head appear an astonishing distance ahead. Not to be outdone in this manner, the next time he disappears we pull steadily, and we are almost within reach of the little fellow as he bobs to the surface. Down again he goes; and away we pull, watching eagerly for that little black head to appear. Second after second passes without a spot on the clear mirror ahead, behind, or on either side of us. Have we carried our experiment too far? Has that mite of wild life become a victim to our curiosity? Away out in the lake the two old birds and their one baby are watching. But what is that dark speck scarcely visible among the sparkling morning ripples that are just beginning to ruffle the middle of the lake? Steadily it approaches the trio out beyond. We can scarce believe our senses! How little we reckoned on that great wilderness instinct, ages old, that had taught the tiny fugitive to double back under our boat and make for the open water, and freedom! Pleased rather than disappointed, we turn toward camp.

Along the lake shore we had another opportunity to observe the resourcefulness of Nature's children, when hard pressed. A pair of Spotted Sandpipers had nested near our camp, and their soft ascending *pr-r-r-eet* as they circled along the shore was one of the cheeriest evening voices. We often saw them with their young and noted how quickly, when disturbed, the little grey fellows scuttled under the fringe of bushes that lined the beach. One day coming suddenly upon one of them, we cut him off from his usual retreat. Try as he would he could not get by us. Suddenly he made straight for the water, and, dashing boldly in, swam boldly out into the lake with all the ease and grace of a Duck. The lack of webbed feet troubled him not at all. Stepping back we allowed him to approach nearly to the shore when, suddenly stepping forward again, we made as if to seize him. In a trice he was under the water and swimming again for safety. Swimming? Nay, rather flying under water, for now the legs were stretched straight behind, and the unfeathered, paddle-like wings were used as easily as if that was to be their ultimate mission. And in his remote ancestors so, no doubt, it was.

In the dense growth behind our tent the birds were innumerable. The shy Ovenbird's shrill call came ringing down the long green aisles even at midday; but at night we heard his true love song. When darkness was falling upon the slopes, and most of the evening voices had ceased, starting from some high perch, he would rise higher and higher in air, singing all the while, till, the song suddenly ceasing, he dropped abruptly into the darkening woods.

All day long the sweet soliloquy of the Red-eyed Vireo came floating down from the high beeches. What an idle fellow he seems. But find him if you can, up there in the maze of leaves; and in the pauses of his song you will see his gray form ever flitting from twig to twig, and those keen eyes ever searching the under surfaces of the leaves where innumerable insects lie concealed.

For several days near the last of August the slope rang with the music of a little Winter Wren. His song was new to us; and it was only after a long weary scramble over logs and through thickets that we espied his diminutive brown figure sitting atop an old brush heap, and pouring forth his floods of delicious melody.

What continuous delights were those long walks through the woods to the village! The roadsides abounded in Warblers—Yellow, Black-throated Green, Black-and-white, Canadian, Myrtle, Magnolia, and Chestnut-sided; with Maryland Yellow-throats, and Redstarts.

An insignificant but unusual song called our attention to the top of those tall spruces. Some

small bird was hidden somewhere among their tops. Suddenly he came into full view, and the morning sun flashed upon the gorgeous orange throat patch of the Blackburnian Warbler. A meeting with this animate gem is about worth a journey to the north woods.

Farther up the road by a clump of hackmatacks we were stopped one day by a low sweet song resembling that of the Purple Finch, but more Robin-like. Investigation revealed our old red-coated friend of the white winter landscape, the Pine Grosbeak. 'Tis true the books tell us he breeds in the far north; but here in the cool Nova Scotia woods we met him and his sober-colored mate, and day after day we listened to his dreamy love song.

By the green alder thicket near the brook we paused to hear the ringing cadence of the Veery; while farther on, where the road wound by open pasture lands, the mellow golden notes of the Hermit Thrush vied with the clear sweet whistle of the White-throat.

But now the chill nights of late summer were beginning to weave white mist veils over the sleeping bosom of the lake. The clematis and fire-weed were donning their soft down, and in the open the roadsides were becoming gorgeous in golden-rod and aster. The Warblers and Vireos had ceased their songs of love and were joining the ranks of Chickadees, Kinglets and Sparrows. Already faint voices floating down from the starlit sky told that the great southward movement had begun.

For us, too, came the parting from our summer home, and thoughtfully we looked into that last evening's camp fire. The lake lay like a mirror. Three Black Ducks, circling over the islands, settled above our camp, and swimming down by us left long ripples in its glassy surface. A Blue Heron arose from his fishing in the cove above and flapped lazily away toward the setting sun. Gradually the red in the sky and lake changed to gray; and as the stars came out one by one all was still, save the voice of the distant river and deep, deep bass of the old green frog down among his pickerel weeds.

MYXOMYCETES OF THE LAKE NIPIGON DISTRICT

BY F. B. ADAMSTONE, B.A.

DURING July and August of the past summer (1921), while engaged in limnobiological research on Lake Nipigon the writer spent odd moments making a collection of Myxomycetes or slime molds in the surrounding district.

The region about Lake Nipigon is a very rugged hilly country, most of which is quite densely wooded. Among the hills there are numerous small lakes and streams. The forest is composed largely of balsam, spruce, poplar and birch. It is the last of these, in the form of old stumps and rotting logs, which seems to be the favorite substratum for Myxomycetes, but almost any organic material will serve the purpose. No specimens of slime molds were seen until after the middle of July when the prolonged hot weather was interrupted by rainstorms. Thereafter, when rambling through the woods turning over logs and examining stumps, one was almost certain to come upon some, either in the gelatinous plasmodial stage, or in the form of delicate lacy fruiting bodies. The extraordinary life history of these organisms makes them particularly interesting from a biological point of view.

When the ripe fruiting body is shaken or disturbed, a minute cloud of dust-like particles floats away from it. This consists of the spores of the Myxomycete. Should the spores fall upon a suitable medium, they germinate, and from each a small naked droplet of protoplasm escapes. These droplets are usually provided with one or more delicate cilia, by the motions of which they are propelled about in the liquids of the substratum. By growth and subsequent division, a whole host of similar droplets is formed. Eventually a time comes when these fuse in pairs, then the pairs coalesce so that a large jelly-like mass of protoplasm results. The plasmodium, as this structure is called, resembles an enormous amœba, not only in its appearance, but also in its streaming movements and in the manner in which it ingests food material. It is very sensitive to external stimuli at this stage, and usually avoids strong light, living beneath logs or other forest débris. Finally a time comes when its sensitiveness to light disappears, and it comes out into the open sunlight, sometimes being seen as a brightly coloured, gelatinous substance on the side of a stump. At this stage peculiar processes go on within the plasmodium, and as a result small masses of protoplasm are heaped up as rounded globules. The fruiting bodies or sporangia are ultimately formed from these little heaps of protoplasm.

Among the forms collected there are three general types of sporangia which are easily recog-

nized. Nearly all of them, however, are quite minute and occur in small patches on the substratum. On this account, they may easily be overlooked unless careful search is made for them. One of the types of fruiting body most commonly encountered is a delicate, plume-like sporangium of lacy texture, supported by a fine stalk. Another is a very small globular spore case held upright on a fine stalk, while the third is a sessile, globular body which may range in size from less than a millimeter to several centimeters in diameter.

In the collection made at Lake Nipigon there are representatives of twenty-nine species, two of which have not previously been reported as occurring in Canada. The identification of these specimens was very kindly undertaken by Miss M. E. Currie, M.A., of the Department of Botany, University of Toronto, and the writer is also indebted to her for extensive notes relating to each species. The names of the species collected, together with short descriptions, as suggested by Miss Currie, are given below:

1. *Arcyria incarnata* Pers.

Six specimens of this form were obtained, ranging in colour from the typical dark reddish-brown to a pale flesh pink. The capillitium of these specimens is of delicate lacy texture and is attached to a small cup—the whole resembling a small red plume.

2. *Arcyria nutans* Grev. (Fig. 1).

Yellow coloured feathery aggregations of the fruiting bodies of this species were obtained on four occasions. The capillitium is superficially much like the preceding and resembles it closely except for the yellow colour.

3. *Badhamia decipiens* Berk.

This species has not previously been reported for Canada although Macbride in his *North American Slime Molds* records it for New England. The specimen has small, sessile, subglobose fruiting bodies which are sometimes plasmodiocarpous or evenly distributed in grayish yellow masses over the substratum. The cappillitium consists of large, orange branching lime knots connected by thin hyaline threads or sometimes by typical coarse, lime-filled threads. The spores are pale violet-brown, minutely spiculose, and slightly paler and smoother on one side.

4. *Badhamia utricularis* Berk.

The sporangia of this species are globular, bluish-coloured bodies attached to the substratum by means of fine, straw-coloured stalks. The clusters of fruiting bodies have the appearance of bunches of grapes recumbent on the substratum since the stalks are not strong enough to support the sporangia.

5. *Badhamia panicea* Rost. (Fig. 3).

Macbride reports this species as purely a western form and this is the first report of it for Canada. The sporangia are gregarious, sessile, subglobose bodies 6-8 mm. in diameter and of a blue-gray colour. The spores are a violet gray colour, slightly paler on one side and minutely spiculose; but more smooth and more violet in colour than *Badhamia foliccola*. The peridium is transparent and thickly dotted with minute clusters of white lime granules.

6. *Ceratiomyxa fruticulosa* Macbr.

The sporophores are very small unbranched white bodies, and, since they occur in clusters, look very much like a mold or fungus growth.

7. *Comatricha typhoides* Rost.

The stalked, plumose sporangia have a brown colour overcast with a silvery sheen, which is due to the remnants of the peridia.

8. *Craterium leucocephlalum* Ditm.

Small groups of minute, goblet-shaped, brownish sporangia characteristic of this species were found on dead balsam leaves. The brown colour is often strongly masked by white.

9. *Dictydium cancellatum* Macbr.

The collection of this species is typical having minute, globular brownish-red fruiting bodies supported by short, slender stalks.

10. *Diderma spumarioides* Fr.

The typical sporangia, in this case, are small, globular, sessile bodies of a gray colour. Instead of the usual substratum of birch bark this specimen fruited on a poplar leaf and the sporangia covered both sides.

11. *Fuligo septica* Gmel.

Two collections were made. One, about 1 cm. in diameter, has a pale yellow lime crust over the surface of the fruiting body with large yellow lime knots; the other, 3 cm. in diameter, has a white lime crust with large yellow lime knots. When the spores have been partly shaken out the surface has a peculiar fluffy appearance, which resembles, in miniature, the remains of a wasp's nest.

12. *Leocarpus fragilis* Rost.

The sporangia are brownish, short-stalked, obovoid structures. The peridium forms a rather solid crust over the surface of the sporangium.

13. *Lycogala epidendrum* Fr.

Large globular fruiting bodies of a brownish colour are characteristic of this species and are easily recognized because of their size and commonness.

14. *Mucilago spongiosa* Morg.

The grayish sporgania are grouped in stalked, grape-like clusters arising from the white hypothallus. The lime crust, which is usually present, has disappeared. The æthalium is 8 cm. long and

is spread out over a stick. Froth-like masses of the mold frequently encircle stalks of grass or herbs at a short distance from the ground, the whole having the appearance of the frothy material of the spittle bugs seen on meadow grass in summer.

15. *Physarum compressum* Alb .& Schw.

In the single specimen obtained, the pale gray, subglobose sporangia occur closely crowded together on the substratum, or, in some cases, intermixed with plasmodiocarps, and a few are scattered singly. There are rounded and angular sparkling lime knots connected by thin hyaline threads. The spores are spiculose and slightly paler on one side.

16. *Physarum globuliferum* Pers.

A large specimen was found on a birch stump. The sporangia were of a mauve colour and each consisted of a small, globular spore case supported by a fine stalk. The size of the patch of sporangia was so extensive in this case that the side of the stump on which it appeared had a mauve colour

17. *Physarum viride* Pers.

The small gathering shows some sporangia with short dark stalks, and some sessile. The peridium is a golden yellow and the capillitium consists of a network of hyaline threads connecting slender, pisiform, orange lime knots. The spores are nearly smooth, 10 microns in diameter.

This gathering is peculiar in that the sporangia are not like the typical form, that is, they are neither nodding on slender black tapering stalks nor are they symmetrically lenticular or subglobose.

18. *Physarum viride* Pers. Var. *aurantium* Lister.

The typical globular gray sporangia, nodding on a fine stalk, are present in this specimen.

19. *Physarum polycephalum* Schwein (Fig. 2.)

This species is characterized by small, grayish lobed sporangia supported by a slender stalk. In the specimen obtained there are sporangia which are lenticular in shape as well as the characteristic type. The capillitium is made up of hyaline threads connecting deep yellow lime knots.

20. *Stemonitis herbatica* Peck.

Three specimens were obtained and these illustrate well its great variability. The sporangia are plume-like networks of brown capillitium supported by fine stalks. One of the specimens has a cluster of ferruginous sporangia 7-8 mm. in height and the spores are almost smooth. Another has fruits 7-8 mm. high, but these are fuscous in colour and the spores are slightly more violet and are roughened with minute warts. In the third collection the fruits are 4-6 mm. high and the spores and capillitium are typical. The capillitium of each consists of a dense intermediate network ending in a small-meshed superficial net. Specimens of this species were the first slime molds observed. They appeared on a stump in the form of small, round, white bodies which might have been mistaken for the eggs of some insect. During the night the white bodies elongated, their colour changed from white to dark brown and they transformed into the beautiful delicate fruiting body typical of this species.

21. *Stemonitis ferruginea* Ehrenb.

The representative of this species is rather poor but the sporangia are the typical short brownish ones of the plumose kind.

22. *Stemonitis fusca* Roth.

This gathering is composed of a cluster of dark brown plumose sporangia 4 mm. high. The spores are 8 microns in diameter and their surfaces are reticulate.

23. *Stemonitis splendens* Rost. (tentatively).

In this specimen the sporangia consist of long brown plumose bodies supported by a fine stalk.

24. *Trichia decipiens* Macbr.

The collections of this species have dark brownish globular sporangia supported by a fine stalk. The coloration is peculiar, yellow to yellowish-brown being more typical. The elaters are a deep yellow colour and are very similar to some species of *Trichia botrytis*.

25. *Trichia favoginea* Pers.

In this species the sporangia are characteristically bright yellow sessile bodies of elongate oval form.

26. *Trichia persimilis* Karst.

A small mass of densely-crowded, ochre-coloured sporangia make up this collection. The spores are covered with coarse, angular, pitted, wart-like structures which give them an irregular outline.

27. *Trichia varia* Pers.

This specimen was immature when collected and has not the ochre hue of ripe fructifications. The elaters are typical, having two loosely wound spirals, but the spores are thin-walled and irregular in shape.

28. *Tubifera ferruginosa* Gmel.

A typical flat, brownish æthalium 2.5 x 1 cm. was collected. The surface of the cushion-shaped mass of sporangia presents a honeycomb-like appearance where the tips of the sporangia are broken off.

29. *Tubifera stipitata* Macbr.

This species is much like the last except that the sporangia are stalked and the cluster thus raised from the substratum.

A LIST OF SHELLS FROM GODERICH, ONTARIO.

BY BRYANT WALKER

IN the summer of 1921 Mr. A. W. Andrews, the well-known coleopterist of Detroit, Mich., spent his vacation at Goderich and very kindly collected for me such shells as he came across while in the field.

The list, although not large, is of interest as it includes at least one form not hitherto recognized in Canada and extends the range of several others very considerably towards the west and seems worthy of preservation as a local list.

Polygyra albolabris (Say).

Ten fully matured specimens are all rather thin and noticeably greenish in tinge. They vary in height from 16 to 21.20mm. with an average of 18.18 mm. and in diameter from 23.75 to 29 mm. with an average of 26.7 mm. The axial index varies from .641 to .859 with an average of .684.

A comparison of the average shell of this series with the average shells from the Upper and Lower Peninsulas of Michigan and the Charity Islands, Lake Huron, (Walker, Occ. Pap., Mus. Zool., Univ. Mich., No. 7, 1915, p. 2) may be made as follows:—

Locality	Height	Diameter	Axial Index
Upper Peninsula	17.02	25.81	.654
Lower Peninsula	18.10	27.10	.677
Charity Islands	18.51	26.33	.704
Goderich	18.18	26.70	.684

This shows the Goderich shells to be larger in diameter than those from the Upper Peninsula and the Charity Islands and smaller than those from the Lower Peninsula; but higher than those from the Upper and Lower Peninsulas and lower than those from the Charity Islands.

Polygyra thyroidus (Say).

Rather small, varying from 21 to 22 mm. in diameter and like the preceding species decidedly tinged with green.

Polygyra tridentata (Say).

Rather small, varying from 12 to 14 mm. in diameter and quite depressed.

Polygyra monodon (Rack).
" " *fraterna* (Say).
Pyramidula alternata (Say).
" *cronkheitei anthonyi* Pils.
" " *catskillensis* Pils.

So far as I can ascertain this is the first record for this form in Canada.

Helicodiscus parallelus (Say).
Mesomphix inornata (Say).

This seems to be the first Canadian record for this species west of Ottawa. In the United States it ranges from New York southwest through Ohio, into southern Indiana. The supposed records from Michigan are either unauthenticated or fraudulent.

Zonitoides minuscula (Binn).
" *arborea* (Say).
Vitrea hammomis (Strom.).
" *binneyana* (Mse.).
" *lamellidens* Pils.

This rare (in the north) species has hitherto been recorded in Canada only from Ottawa (Walker, *Ottawa Naturalist, XIV*, 1900, p. 90). Mr. Andrews' discovery extends its range very considerably to the west.

Vitrea ferrea (Mse.).
" *indentata* (Say.).
Euconulus fulvus (Dr.).
Circinaria concava (Say).
Vallonia excentrica Sterki.
Gastrocopta armifera (Say.).
" *tappaniana* (C.B. Ads.).
" *contracta* (Say.).
Succinea ovalis Say.
Cochlicopa lubrica (Mull.).
Carychium exile H. C. Lea.
Lymnæa humilis modicella Say.
" sp.?

A single, very small specimen, probably immature, with a broadly reflected columella that I cannot place.

Planorbis parvus Say.
Physa sayii warreniana Lea.

I think that this is the first record for this form in Canada.

Goniobasis livescens (Mke.).
Pomatiopsis lapidaria (Say.).
Amnicola sp.?

A single specimen of a small species that I have been unable to identify satisfactorily.

Sphærium striatinum (Lam.).

Mr. Andrews reports that he saw no signs of there being any *Unionidæ* in the river at Goderich.

Mr. Justice Latchford states in reference to Dr Walker's paper that he has not had a favourable opportunity to collect shells on his official visits to Goderich, but that once while walking there near the mouths of the Maitland he picked up a living *anodonta* which he thought to be the variety of

edentula known as *pavonia*. Attached to it was a small *ancylus*. Both shells were broken in transit from Goderich.

In regard to *Physa sayii warreniana*, he says that in the opinion of Dr. Frank Collins Baker of the University of Illinois, *warreniana* is a very common shell in the vicinity of Ottawa, and is the proper name of the beautiful pearly *physa* found in Brown's Inlet, west of Bank Street, and in the Rideau River as well as of the darker form called *heterostropha* in the publications of the Ottawa Field-Naturalists' Club. Dr. Baker has examined large sets of Canadian *physæ* submitted to him by Justice Latchford, and has identified tentatively nearly all of them. Many appear to be new to Canada, and some may be undescribed. A provisional list will appear in an early number of *The Naturalist*.

A BIOLOGICAL RECONNAISANCE ON GRAHAM ISLAND OF THE QUEEN CHARLOTTE GROUP

BY CLYDE A. PATCH.

(*Concluded from Vol. XXXVI, No. 6, p. 105*)

Arenaria melanocephala. BLACK TURNSTONE.—On July 21, a specimen was collected near Massett Reserve, and from July 27 on, several small flocks were seen on Yakan Point. On September 5, a flock composed of eight Black and three Ruddy Turnstones was seen on Yakan Point. Massett, July 21; Rose Spit, August 20; Tow Hill, September 5. "The Massett specimen has traces of spring plumage on sides of breast and is therefore adult, the other specimens are probably juveniles."

Hæmatopus bachmani. BLACK OYSTER-CATCHER.—On July 5, two adults were observed on the rocky shore in front of the old Indian village (Yan) which s located on Massett Harbour about opposite Massett Reserve.

Dendragapus obscurus sitkensis. SOOTY GROUSE.—Fairly common. During the moult, which takes place in August and the fore part of September, they frequent the roadways where the sand, which has been used to some extent as road building material, makes desirable dust baths. This year at least large broods were not in order judging by the families observed as follows: 1 female and 6 juveniles; 1 female and 2 juveniles; 1 female and 4 juveniles; 1 female and 2 juveniles. The Indians sometimes catch grouse with a noose on the end of a pole. Ten adult and three juvenile specimens were taken from August 6 to September 21 at Massett and Tow Hill. "These birds are probably referable to the above form lately described by Swarth (*Condor*, 1921, pp. 59-60). The males are all dark birds, the females rather reddish. Most of the males have collars of worn rusty that may be more or less characteristic of Q.C.I. birds, but I am not prepared to say that it is more than fading common to the species at comparable plumage stages or an indication of juvenility."

Phasianus sp.? PHEASANT.—Two years ago Mr. Cecil Baker, living near Tow Hill, released two cocks and a hen. The following spring a brood was seen near Silver Lake, and again last spring juveniles were observed in the same locality. Mr. Chas. Smith, who lives near Silver Lake, informed me that this spring he saw a cock bird dig young potatoes and carry them into the wood. Possibly this was a trait acquired by an individual, or perhaps the potatoes taken harboured grubs.

Columba fasciata. BAND-TAILED PIGEON.—On July 28, a representative of this species was seen in a tree about thirty yards from our camp at Tow Hill, but before I could get my gun it had flown across the river and by the time I reached its resting place it had disappeared. None of the inhabitants, some of whom are fairly well acquainted with birds, had ever seen the pigeon, of which I showed them a coloured picture. The nearest substantiated record of this species is from Bella Coola, B.C.

Accipiter velox. SHARP-SHINNED HAWK.—Not uncommon. On two occasions this species was seen annoying a party of Jays by darting at individuals when they emerged from the dense evergreen growth, and on another occasion one was seen alternately pursuing and being pursued in a listless manner by several Crows. Six specimens. Massett and Tow Hill, July 5 to August 9. "These are all juvenile birds in very dark plumage and suggest a possible subspecies."

Astur atricapillus subsp.? GOSHAWK.—A bird of the year was secured September 12, that had been annoying poultry in the vicinity of Massett. Mr. Dave Rutten of Massett has a mounted specimen. Juvenile, Massett, September 12. "This is a dark bird with broad, sharp and very dark stripes below and on breast. The ground color is deep cream, almost tawny on the breast. We have one adult of unknown sex from Massett, taken in February, 1920, by W. T. G. Hellier. This specimen is very dark, almost black on crown and back, and

broadly washed with the same color on flanks and across breast. The vermiculation is coarse and suffused, and the feathers below and in front broadly shaft-streaked. Both these types of coloration (juvenile and adult) are included amongst the types of *striatulus* originally described by Ridgway. This is a well-marked form in these specimens, but it is evident that we will have to revise our conceptions of the characters and range of this subspecies. It is not the breeding form of southern British Columbia, where it only occurs as a migrant, and, judging by the number of specimens obtainable, a rare one. It is not characterized by fine vermiculation but shows a general suffused darkness and broad shaft-streaks. There is no evidence that the species breeds on the Queen Charlottes, and the nesting area is a matter of supposition."

Buteo borealis calurus? RED-TAILED HAWK.—Three were observed on the border of the muskegs in the vicinity of Tow Hill. The stomach of the specimen collected contained the remains of several toads. Tow Hill, August 7. "This is a very dark and richly coloured bird. However, it does not approach the black phase of the Western Red-tailed. Below it shows much greater increase or depth of red color, rather than an extension of the black. Hoyes Lloyd has a very similarly coloured bird from southeastern British Columbia, and J. A. Munro says he has seen several birds from the Q.C.I. quite similar to it. It therefore seems to be a rather constant coast type of coloration which we have not seen from elsewhere."

Haliætus leucocephalus. BALD EAGLE.—Two or three birds were usually seen in the course of a day's tramp. White-marked and brown individuals were present in about equal numbers.

Falco peregrinus pealei subsp. (?). DUCK HAWK.—At least two juveniles and two adults were seen about Tow Hill. Several local residents informed me that they annually nest on Tow Hill's ledges. I found the remains of three Cassin Auklets on which they had been feeding, and on two occasions saw individuals pursuing waders which in both instances succeeded in eluding the pursuer. I was informed that this species is not uncommon on North Island. Two juveniles, Tow Hill, July 28. "Though these are both rather dark birds, they are separated from some eastern specimens only with difficulty."

Pandion haliætus carolinensis. OSPREY.—Two were observed on the north beach, one on July 27 near the mouth of the Skonun River and the other on September 5 near Tow Hill.

Cryloglaux acadica brooksi. SAW-WHET OWL.—After dusk on July 5, a female and three juveniles were collected in the wood bordering the dry creek bed just back of Massett Reserve, and on the evening of July 21, three juveniles were collected in the same locality. My attention was attracted to these birds by the "saw-whetting" cries of the young. Some of the stomachs contained plumage that will probably prove to be that of some warbler, though it is to be hoped that this will be found to compose only a small percentage of the stomach contents of these handsome little birds. One adult and three juveniles, Massett, July 5; three juveniles, Massett, July 21. "All but one of these are in the juvenile plumage comparable to the *kenicotti* plumage of eastern birds. They are obviously to be referred to *brooksi*, not *scotæa* described by Osgood as from Q.C.I. I should not be surprised to find that this form is deserving of full specific rank."

Otus asio subsp.? SCREECH OWL.—On August 7, I believe I heard two individuals in the wood bordering a muskeg near Tow Hill.

Nyctea nyctea. SNOWY OWL.—I was informed by Mr. Thomas Deasy, Indian Agent at Massett Reserve, that he had twice seen this bird near the reserve, and Mr. Cecil Baker, living near Tow Hill, told me he had shot two of these birds near his place.

Ceryle alcyon. KINGFISHER.—The Hiellen River, Chown Brook, and the vicinities of Massett and Massett Reserve were each frequented by several birds. Massett, September 12.

Dryobates villosus picoideus. WOODPECKER.—About ten individuals were observed during our stay. Four adults and four juveniles were collected at Massett from June 25 to September 22 ."These are all well marked *picoideus* in general coloration, though I cannot see the barred-back character called for by Osgood. Most of the white dorsal feathers have centre spots which other members of the species do not show, but I can hardly say that this would be described as cross-barring. The red crowns of the juveniles are more pronounced in the male specimens. In general coloration, especially below, some specimens show individual intergradation with *harrisi*, and even in the spotting of the back feathers the same may be true."

Sphyrapicus ruber. RED-BREASTED SAPSUCKER.—During our stay twelve individuals were observed. On June 30 what appeared to be a family party, consisting of three juveniles and two adults, was collected in a stretch of wood between Massett and Massett Reserve. Five specimens, Massett, July 1.

Colaptes cafer saturatior. FLICKER.—Two or three individuals were usually observed during the course of a walk through the more open wooded areas or along the margins of the muskegs. Juvenile, Massett, July 12; juvenile, Tow Hill, September 5; juvenile, Tow Hill, September 6. "These birds,

whilst dark, are somewhat lighter than typical *saturatior*, and are also lighter than several specimens from southern British Columbia (V. I.). Neither are they quite pure *cafer*, but all show more or less distinct *auratus* influence. One specimen has the gray throat feathers tipped distinctly with fawn, and small black indications in the red mustache. In none of them is the gray of the throat perfectly pure and without traces of fawn. Since they are juveniles, perhaps too much stress should not be laid on this slight throat veiling."

Selasphorus rufus. RUFOUS HUMMINGBIRD.—Common at the time of our arrival and until July 5, after which time they were comparatively rare. Their disappearance may have been due to the fact that after the first week in July, the sallal blossoms at which they had been feeding began giving place to fruit, and the birds possibly migrated to localities where other food was abundant. Hummingbirds are frequently found dead on the window sills of the settlers' homes out of which they have been unable to find an exit after having been enticed in by the house plants. Three specimens, Massett, July 1-2. "Probably all juveniles."

Empidonax difficilis. WESTERN FLYCATCHER.—Throughout our stay, one to five birds per day were observed in the more openly wooded areas. Four specimens, Massett, July 24 to August 1.

Cyanocitta stelleri carlottæ. QUEEN CHARLOTTE JAY.—Fairly common. Usually moving about in family parties. Frequently seen feeding on green fruit of the Skunk Cabbage which they manage to remove from its stem and carry to a comfortable spot on a trail, roadway or log. On one occasion a Jay was observed to capture a young wood mouse. The settlers sometimes use Jay flesh for trout bait. Four adults and eight juveniles, Massett, June 28 to September 26. "These particular specimens are only slightly different from some northern Vancouver Island specimens, but the Dwight and Bishop collections contain *carlottæ* with strongly marked subspecific characters."

Corvus corax sinuatus. RAVEN.—Present at all points visited. Usually in what were probably family parties consisting of three, four or five individuals. On June 24, a juvenile and an adult male were taken in company. With the beginning of September they evidently congregate in larger flocks, as one day fourteen and another day nineteen were seen winging about the wood at the base of Yakan Point. The Raven appears to get more joy out of life than any other species with which I am acquainted. I have seen two birds, one above the other, drift out of the wood and for a quarter of a mile up the beach in the face of the wind, and every few yards as they drifted the lower bird, without apparent effort, rolled sidewise completely over. At other times I have seen a bird alight on the beach and make several grotesque hops over the same spot before coming to rest. Adult and juvenile, Massett, July 24.

Corvus caurinus. CROW.—Common in certain localities, particularly on the beaches and in the adjacent woods in the vicinity of Massett and Yakan Point. They feed to a considerable extent on dead crabs, with which the beaches are at times strewn. A nest, discovered June 28 and containing three juveniles just able to fly, was situated five feet from the ground in sallal growth. Juvenile, Massett, June 28. "Too juvenile to identify specifically, but included under this species on the general probabilities."

Pinicola enucleator subsp.? PINE GROSBEAK.—Only three individuals observed. On July 5, I was unable to find a wounded male first seen on the beach east of Massett Reserve, and two days later I failed to collect a pair observed in heavy timber near Massett.

Loxia curvirostra minor. CROSSBILL.—Abundant. Flocks of 50 or so were not infrequently observed extracting seeds from the spruce cones. The song of this species, usually emanating from a solitary individual resting in the top of an evergreen, was frequently heard throughout our stay. Three specimens, Massett, June 25; Massett, July 1. "13998 is mixed gold and orange plumage, the former predominating; 13999 olive with indistinct yellow and orange veiling; 14000 olive; 14028 gold, orange and red about equally present."

Spinus pinus. PINE SISKIN.—Apparently not common, as it was observed on only three occasions as follows: June 25, three individuals; July 7, fifteen; and July 21, two. One juvenile and two adults, Massett, June 25. "The juvenile is just out of the nest, indicating breeding in the vicinity."

Junco hyemalis oreganus. JUNCO.—Fairly common in the more open areas. During the last week in July and thenceforth they were usually observed in flocks of from 15 to 30 individuals. A juvenile just able to fly was collected on July 8. Massett, June 24; Massett, July 8; Massett, September 20.

Melospiza melodia morphna. SONG SPARROW.—Fairly common in the shrubbery contiguous to the beaches. Juvenile, Massett, June 25; two specimens, Massett, September 20. "These skins have the appearance of being very large, but as the tails, wings and bills do not seem to be appreciaiy larger than those of other *morphna*, this is probably due to the fresh, unworn, fall plumage and to 'make up'. A large series from the islands would be desirable."

Melospiza lincolni. LINCOLN SPARROW.—Not uncommon. Frequents the muskegs and the flats

bordering Delcatla Inlet. During one day twelve ndividuals were observed in the vicinity of Silver Lake. It appears to be a rather shy species usually seen making quick, short flights from cover to cover. Tow Hill, August 4; four specimens, Silver Lake, August 21. "The only difference I can see between these and eastern birds is a slight increase in the weight of the dark crown streaks. It is too fine a distinction, however, to found or name a subspecies upon."

Passerella iliaca subsp.? FOX SPARROW.—Shy and not abundant, only six or eight being observed, usually in dense undergrowth. Two specimens, Massett, June 24; Massett, September 20. "These are very heavily coloured birds which I do not wish to identify until I can go over the whole species with care."

Hirundo erythrogastra. BARN SWALLOW.—Not common. One or two birds could usually be seen about Massett Reserve. On July 7, ten adults and four nests were observed about an unoccupied house on the flat near Delcatla Inlet. One nest contained eggs while the others held nestlings of various ages. Later in the season nests in which broods had earlier been raised were found in abandoned shacks situated in small, isolated forest clearings. August 24, a flock of twenty-four adults and juveniles was observed near the base of Yakan Point. Three juveniles, Tow Hill, August 7.

Iridoprocne bicolor. TREE SWALLOW.—Fairly common in the vicinity of Massett Reserve from the time of our arrival until our departure for Tow Hill where none were observed. Juvenile, Massett, July 3.

Vermivora celata lutescens. ORANGE-CROWNED WARBLER.—This warbler is probably better represented than any other as about twenty-five individuals were observed. They were several times seen in company with Chickadees. On July 5, two juveniles accompanied by an adult male were collected. Adult and two juveniles, Massett, July 4; Tow Hill, August 15. "These are all good *lutescens*."

Dendroica townsendi. TOWNSEND WARBLER.—About eighteen individuals were observed during our stay. In September they were seen in company with Chickadees, Kinglets and Brown Creepers. June 25, juveniles were observed being fed by the parent birds. Two juveniles, Massett, June 25; Tow Hill, September 5.

Wilsonia pusilla subsp.? WILSON WARBLER.—Only four were seen, all in the vicinity of Tow Hill. Tow Hill, August 9; Tow Hill, August 15. "I have not quite decided whether these are *pileolata* or *chrysolea*. They do not seem obviously typical of either."

Nannus hiemalis pacificus. WINTER WREN.—A few individuals were invariably observed in the undergrowth along the roadways. Juvenile, Massett, June; Massett, July 1. "Plainly *pacifica*."

Certhia familiaris occidentalis (?) BROWN CREEPER.—Only a few individuals were observed during our stay. This species was several times seen in company with Chickadees, Kinglets and Warblers, where its presence was apparently distasteful to the Chickadees, as they frequently darted at it with angry twitters. Adult and three juveniles, Massett, July 4. "*Occidentalis* seems the form Ridgway ascribes to the humid coast, and that is the form Osgood refers his Queen Charlotte Islands specimens to. The one adult in this lot does seem perceptibly browner above and below than eastern birds and those from the southern interior of British Columbia, but the difference is not marked."

Sitta canadensis. RED-BREASTED NUTHATCH.—Not common. A total of thirteen individuals was observed in the vicinity of Tow Hill. Four specimens, Tow Hill, August 1. "These birds are an unusual bright and even reddish below."

Penthestes rufescens. CHESTNUT-BACKED CHICKADEE.—Fairly common. Flocks of this species were usually accompanied by Kinglets, frequently by Brown Creepers and Warblers, and on one occasion by a Nuthatch. Three specimens, Massett, September 22.

Regulus satrapa olivaceus. GOLDEN-CROWNED KINGLET.—Fairly common. Almost invariably in company with Chickadees, and frequently with Brown Creepers and Warblers. Juvenile, Massett, July 5; two juveniles, Tow Hill, September 2; two adults, Massett, September 22. "These birds are very slightly brighter in colour on the back than comparable eastern birds. I rather hesitatingly refer them to *olivaceus* which seems a very slightly defined race."

Hylocichla guttata nannus. HERMIT THRUSH.—Common until the middle of July, after which time the number observed gradually decreased. Three specimens, Massett, June 26.

Planesticus migratorius propinquus. WESTERN ROBIN.—Common until the latter part of July, after which time they appeared to decrease in number. Considerable areas of land have been cleared in the vicinity of Massett Reserve, which may account for the fact that this species was more abundant there than in the other localities visited. Juvenile, Tow Hill, August 4.

Ixoreus nævius. VARIED THRUSH.—During the course of a day's walk one to four individuals were usually observed. A juvenile collected June 4 had only recently left the nest. Juvenile, Massett, June 4.

NOTES AND OBSERVATIONS

OCCURRENCE OF THE RED-THROATED LOON AT ROSSPORT, ONT.—Rossport, Ontario, is a station on the Canadian Pacific Railway about 50 miles east of Nipigon, and, as the name indicates, lies on Lake Superior. It is a fishing village pre-eminently, and little attention is paid to anything else. On my arrival there on June 20, 1911, I found in the yard of the little hotel, a drowned bird hanging on a ladder to dry. Enquiry elicited the fact that it was not wanted by anyone and that I might have it, so I promptly made a skin of a fine female Red-throated Loon. There was no indication of activity in the ovaries, so I presumed the bird was incubating or feeding young. Nesting of this species is probable in the small lakes back from Superior.—W. E. SAUNDERS.

OCCURRENCE OF IMMATURE EVENING GROSBEAKS IN ONTARIO.—On the shore of Pine Lake, Ontario, near Ingolf, early on the morning of August 5, 1920, we were awakened by the breakfast calls from hungry young throats in Knudsen's garden, and to our great delight we distinguished the mellow chatter of Evening Grosbeaks. Hastening out, we found an adult female feeding her two insatiable young birds—the first young Evening Grosbeaks, we believe, to be recorded for Ontario. The birds were carefully observed at close range with the aid of 8X binoculars. The fully fledged young were able to make the serpentine flight of the Grosbeaks, and they were observed flying about with their mother during the following three hours, while we remained there, but were not seen during the afternoon of August 12 when we returned after canoeing about Hawk, Falcon and High Lakes and Falcon River. Our complete records of Evening Grosbeaks made during this trip are: August 5, 6.30-9.30 a.m., adult female feeding two young near Pine Lake, Ontario; August 6, 2 p.m., heard, then saw, three flying north towards us from over Falcon Lake, Manitoba; August 7, 8.45 a.m., three flying westward along north shore of Falcon Lake; August 8, 7 a.m., "heard Evening Grosbeaks, Falcon Lake"; August 9, 7.40 a.m., heard, then saw, four flying high southward over High Lake; August 10, 5.40 a.m., two, and between 6.45 and 7.50 a.m., four individuals flying singly west along north shore of Falcon Lake, while at 8:00 a.m., six in a flock flew east (probably the earlier six returning). While the long wavy flight of the Grosbeaks would carry them easily from one of these lakes to another, it seems more probable that there were at least three on Pine, six at Falcon, and four on High Lakes.

In *The Auk* for October, 1920, (Vol. XXXVII, pp. 585-6), Prof. Wm. Rowan records the breeding of the Evening Grosbeak in Manitoba. He says also: "Mr. Lawrence visited Pine Lake on the borders of Manitoba and Ontario (actually in Ontario) on July 3. He found the Evening Grosbeak in some numbers but found no nest." This fact coupled with our record of the young birds seen 33 days later at or near the same place makes it seem very probable that Evening Grosbeaks bred in western Ontario in the summer of 1920. P. A. Taverner's article on "The Evening Grosbeak in Canada", (*The Canadian Field Naturalist*, March, 1921, Vol. XXXV, pp. 41-45) makes no mention of young Evening Grosbeaks ever having been recorded for Ontario.—RALPH E. DELURY; JUSTIN S. DELURY.

PALM WARBLER (*Dendroica palmarum palmarum*) AT HATLEY, QUE.—So far as I am aware this is the only record for the Province of Quebec. The bird first attracted my attention on May 12 of the present year, 1922. It was flitting about in a small wood adjoining the little marsh near my house, and from the first I felt sure it was *palmarum* and not *hypochrysea* or the Yellow Palm Warbler, as the under parts were very dull in comparison to the bright yellow of an example of *hypochrysea* I had seen in this same wood only a few days before. However, it was late in the afternoon, and having no gun I had to content myself with the hope that it would be there the following day. In this I was not disappointed, and after a search of some two hours, I again found the bird in a cedar tree and secured it, and later on sent it in the flesh, and presented it to the Victoria Memorial Museum at Ottawa. I find on reference to Knight's *Birds of Maine*, 1908, that there is no record of the species ever having been taken in Maine. Miss Inez Addie Howe of The Fairbanks Museum of Natural Science at St. Johnsbury, Vermont, writes me on June 10, 1922, that there are no records in the Museum for Vermont, their type specimens having been taken in Massachusetts. In Allen's *Birds of New Hampshire*, there are no spring records given, but an example was secured at Shelburne in the Androscoggin Valley on September 16, 1884, as recorded by Dr. A. T. Chadbourne, and Mr. Allen speaks of having taken specimens in the Saco Valley at Intervale between the 8th and 14th of September. Its reported presence at Manchester in spring, he goes on to say, is probably an error (*Proc. Manchester Inst. Arts and Sci.*, Vol. 11, p. 82, 1901). In *Life and Sport on the North Shore* (of the St.

Lawrence) by Napoleon A. Comeau, 1909, there is a reference on page 433 leading one to imagine that the Palm Warbler had been met with on some few occasions at Godbout. This is evidently an error, the birds referred to without doubt being the Yellow Palm Warbler (*D. palmarum hypochrysea*). At all events they are treated as such by Mr. Ridgway in his *Birds of North and Middle America*, Vol. 2, 1902.—HENRY MOUSLEY.

NOTE ON BRONZED GRACKLES.—Mr. C. E. Johnson (Vol. XXXVI, p. 60) speaks of Bronzed Grackles picking up dead minnows in gull-fashion from the surface of the water. Besides acting as scavengers these birds sometimes capture living fish. This I have seen them do in the Charles River Basin in Boston ,and their prey was the three-spined stickleback. See *Auk*, XXXVI, 1919, p. 627.—CHARLES W. TOWNSEND, M.D.

EFFECT OF LIGHT ON COLOR OF BIRDS.—A distinguished lawyer in Winnipeg persists in declaring that last fall he saw amongst a large flock of Red-winged Blackbirds several that were "red-headed". I am convinced that Mr. L. L. Snyder is right in his allusion to the "effect of light that causes frequent reports of impossible birds". I have suggested to the lawyer that he saw some Brewer's Blackbirds illumined thus; but no, he won't have it!—H. M. SPEECHLY.

OCCURRENCE OF THE ROCK VOLE AT ROSSPORT, ONTARIO.—During my stay at Rossport, Ontario, a little fishing village on the Canadian Pacific Railway about fifty miles east of Nipigon, in the latter part of June, 1911, the nights were devoted to trapping for small mammals and I had the satisfaction of taking a small number of *Microtus chrotorrhinus*, mostly gravid females and young. One specimen was taken in the sparsely wooded country and after that I hunted for more favourable places and trapped on the railway enclosure where there was a growth of grasses concealing the runways of the vole. The Biological Survey, Washington, writes me that this is several hundred miles west of the nearest previous location.—W. E. SAUNDERS.

CHILDREN COMPETE FOR FORESTRY ESSAY PRIZE.—Scores of school children in every school district of the Dominion are competing these days in the national school essay competition on Forestry and Tree Planting, inaugurated recently by the Canadian Forestry Association.

Questions as to the forest resources of Canada, the damage done by forest fires, what trees to choose for planting and how to plant them are being asked by a multitude of young people and the resultant information is being applied to the essay competition. Three substantial cash prizes are being given in each province and the effect of the national effort to stimulate juvenile interest in the forest resources of the country and the multiple benefits of tree planting has secured the hearty endorsation of all the departments of education which are giving every co-operation.

BOOK REVIEW

A GUIDE TO THE POISONOUS PLANTS AND WEED SEEDS OF CANADA AND THE NORTHERN UNITED STATES. R. B. Thomson, B.A., F.R.S.C., Associate Professor of Phanerogamic Botany, University of Toronto, and H. B. Sifton, M.A., Assistant Professor of Research in Botany, University of Toronto. *University of Toronto Press*, 1922, 8°. 169 pages with 40 illustrations in the text. Price, $2.50.

This very attractive book was primarily written for the purpose of serving as a text-book for the students of the Ontario Veterinary College. As such it contains, in a brief, yet not unduly concentrated form, all available up-to-date knowledge of the poisonous plants encountered in Canada and the northern United States, including the characteristics by which they may easily be recognized, the symptoms produced by them, and the treatment required to effect cures in cases of poisoning.

In the treatment of their subject the authors have departed from the usual method followed in most books and bulletins dealing with poisonous plants. Instead of arranging the plants in one long and, as a result, often confusing and tiresome list in accordance with their botanical relationship which hitherto has been a general practice, the authors have divided the book into four main sections dealing with the poisonous plants as follows:

I. Plants dangerous when included in hay and coarse feed.
II. Plants dangerous in pasture and on the range.
III. Plants dangerous in ground feeds.
IV. Poisonous plants which are rarely observed to cause death in animals.

From this arrangement it is seen that the first three sections deal with the plants which are chiefly responsible for fatalities among farm animals; they are therefore of special interest to

those who are particularly concerned in the welfare and health of stock. The fourth section includes plants which rarely cause injury or death to animals but which are poisonous to human beings; it is consequently of particular interest to the public in general.

The following number of poisonous plants are dealt with:

Section I.—Six genera with about a dozen species.

Section II.—Twenty genera with about two dozen species.

Section III.—Nine genera with as many species.

" IV.—Thirty-one genera with about fifty species.

Section III, which deals with poisonous plants encountered in ground feeds, deserves particular attention. It is, as the authors assert, "the first time that the importance of poisonous plant constituents in concentrated feedstuffs has been given recognition in a text book." The importance of including this section is apparent when it is realized that large quantities of elevator screenings containing a considerable proportion of more or less poisonous weed seeds are annually used in the manufacture of concentrated feed. Indeed, the losses suffered from the presence of poisonous constituents in such feed have recently been so great that the Dominion Department of Agriculture has found it necessary to design a special feedstuffs act and to provide for laboratory facilities where concentrated feeds can be microscopically analyzed and the presence of poisonous plant constituents in dangerous quantities ascertained.

In addition to the four main sections briefly referred to, a "Symptoms Key" to the principal poisonous plants is given by which it may be possible to determine, in the case of poisoning, which plant should likely be held responsible. The identification of poisonous plants found in hay or in the field is also greatly facilitated by the 40 excellent illustrations which the book contains.

As already stated, the *Guide to the Poisonous Plants and Weed Seeds of Canada and the Northern United States* was written primarily as a text-book for veterinary students. Its usefulness, however, extends far beyond its primary scope. It is written in such a pleasant style, and it is so free from all but unavoidably necessary technical terminology, that it should make entertaining and profitable reading not only to followers of the veterinary and medical professions and to students of natural history, but also to farmers, stockmen, and the public in general. Public and other libraries would be well advised to secure the book.—M. O. M.

THE CONSERVATION OF THE WILD LIFE OF CANADA, by C. Gordon Hewitt, D.Sc., late Dominion Entomologist and Consulting Zoologist. With numerous illustrations. New York Charles Scribner's Sons, 1921. 344 pages, 23 plates, 4 text figures, 10 maps, and five charts.

While this book is rapidly being recognized as a standard authority on the broad subject which it treats, it is of particular interest to the members of the Ottawa Field-Naturalists' Club, of which organization the late Dr. Hewitt was an active member for several years and president for two years. It contains information with which every true field-naturalist should be familiar and no naturalist's library in Canada will be complete without it.

> The importance of the subject may be realized by stopping to consider that Canada is the home and refuge of the most important and desirable wild animals of this continent. The large wild animals that were once found everywhere in the United States have melted away until only remnants are left in a few inaccessible or protected refuges. The northern part of the continent was less inviting to the settler and the forests, mountains and barren grounds of Canada have proved a sanctuary to by far the greater part of the surviving wild life of North America. The people of the United States now realize and deplore their shortsightedness in unnecessarily destroying their heritage and are endeavouring to rescue the fragments from complete and utter annihilation. The aim of Canada in this regard has been to profit by the mistakes of older countries and prove that the advance of civilization to the more remote sections of Canada shall be more than merely temporary, exploitation implying the total destruction of heritage due to prosperity.

As treated in Dr. Hewitt's masterly book the wild-life problem is restricted particularly to the larger wild mammals, many of which are commonly included under the head of big game, and to the birds of Canada. The fur-bearing mammals, having been recently discussed elsewhere, are not considered at length, except as far as their conservation in the wild state necessarily constitutes an important aspect of the general problem of wild life conservation. Canada is fortunate in having certain species of valuable animals not found elsewhere except in parts of the United States. Among these we find the moose, wapiti or elk, caribou, buffalo, mountain sheep, goats, muskoxen, and antelope, and all of these have been discussed extensively, rationally and sympathetically in Dr. Hewitt's book. It is valuable alike to the technical naturalist and to the general reader.

The value of wild life to the nation is first shown to have an economic significance, not because Canadians lack appreciation of their moral obligations or reasons of sentiment, but because the rapid opening up and development of the country came into direct conflict with the ability of many important forms of our wild life to survive. Lands not suitable for agriculture, as found in many forest reserves or areas of generally unfertile soils, are in many cases capable of a larger utilization by intelligent use of the wild life resources. The common native deer is shown to be an animal which increases and thrives from east to west with anything like reasonable protection and has been proved by practical demonstration in many states to produce a large meat-supply on non-agricultural areas.

The vast area of the Northwest Territories, by far the greater part of which is unsuited to agriculture, may be made to continue productive by properly conserving the game supply as a necessary adjunct to the preservation of the fur industry and the establishment of mining enterprises and other industries. The necessity of conserving a native food supply for Indians and Eskimos in northern districts is an important obligation which rests upon the nation since the common-sense conservation policies followed under the guiding influence of the old-time trading companies have been largely weakened by the enormous increase of cutthroat competition and by the virtual bounties

which are now on the heads of many animals in the shape of excessive prices for their pelts.

The recreative value of wild life is harder to place a value upon. Recreation is now recognized as an important factor in keeping up human efficiency, and who can estimate the influence of wild life in remote parks and mountains as an attraction to draw men out into the open. Whether one be sportsman or photographer, or just plain citizen, the presence of wild bird or animal life adds zest to his enjoyment of the scenery, and the same principle applies to the shortest suburban or country ramble.

One of the saddest features of the history of wild life during recent years has been the disappearance of a number of animals and birds that were formerly abundant, for they are resources which are beyond the power of man to replace. Destroyed forests may be replanted and ravaged cities rebuilt, but a vanished mammal or bird is gone forever. To the biologist, every species wiped out represents the end of a long line of ancestry running back far into the past before man with his destructive arms appeared on the scene.

The main axiom of wild life protection is that a species of animal must not be destroyed at a greater rate than it can increase. The remedy for thoughtless destruction is education, supplemented necessarily by legislation. Birds which have recently become extinct in Canada are the Passenger Pigeon, Great Auk, Labrador Duck, and (perhaps) Eskimo Curlew. Various adverse factors have entered into the wild life problem, the chief ofwhich at all times is the market hunter. While acknowledging that much has been done in Canada towards protection, Dr. Hewitt does not fail to remind us that the sale of game is still permitted in certain provinces. Compared with the rapacity of men the destruction of our wild life by natural factors is slight although it must be considered.

For a long time, naturalists, sportsmen, game conservationists, and the general public who are interested in the wild life of Canada have desired to have in one volume an up-to-date account of the present status of the wild life of the country and a survey of the measures which have to be achieved in the preservation of this great heritage.

The late Dr. C. Gordon Hewitt was admirably fitted for this task. English by birth, a thorough zoologist by training as student and faculty member of Manchester University, of a cosmopolitan and open mind, he attacked problems without prejudice. Trained technically as an entomologist, he early appreciated the value of birds as insect destroyers and before leaving England he had done much to demonstrate publicly the truth of his theories. Coming to Canada in 1909 as Dominion Entomologist, he speedily built up the Entomological Branch to a state of recognized efficiency. But while recognizing the value of entomology, Dr. Hewitt had talents which led him farther afield, and the position of Consulting Zoologist was created for him in addition to his other duties. His acquaintance with the men and the needs of all parts of the Dominion, begun on his frequent visits of inspection to every province, grew with years, and his excellent judgment of men and affairs was brought into excellent service. His standing had always been commanding in scientific circles, and as he realized that the conservation of wild life as a present and future asset of the country was not a question of party politics, his opinions were respected by statesmen and politicians of all parties in the different provinces, where the keenness of his observations, his obvious sincerity of motive, and the clarity of his common sense made his influence of supreme importance in bringing the lagging sentiment of the country into line with the principles of the now famous Migratory Birds Treaty consummated between Great Britain and the United States in 1916.

This much-discussed treaty has already accomplished more than its sponsors imagined in increasing the numbers of wild fowl which were being harried through lack of international co-operation in the preservation of an international asset, by winter market-hunting in the South, spring-shooting in the central states and the Canadian provinces, and lack of protection on the northern nesting grounds.

Dr. Hewitt was also active in framing the Regulations for the enforcement of the Migratory Birds Treaty and a little later was active in drafting the new North West Game Act, a far-reaching measure to protect the wild game and fur-bearing animals of the vast North West Territories and the future interests of the natives and settlers beyond the borders of what are now the settled parts of Canada.

Dr. Hewitt had unrivalled opportunities for obtaining fresh information. A frequent visitor at all the provincial capitals and the experimental farms in all parts of the Dominion, he had the friendship of men of affairs, scientific men, and local naturalists and observers, so that when disputed points came up he could marshal his information at first-hand, and in this book we have the cream of his data assembled systematically. His disarming candour and the absolute fairness of his treatment of colleagues and associates procured him sympathy and support for any plans which he brought forth. The book was adapted to fill a long-felt want and demand and represented a labour of love on the part of Dr. Hewitt during the spare hours of the last three or four years of his life, being completed and made ready for the printer only in the month before his death. Written in a beautifully pure and idiomatic English style, the book appeals from a literary as well as a scientific and educational viewpoint, and the publishers have done their part in bringing out the book in an attractive form. No one could have done the work better, and, coming when it did, it may fittingly be considered as a monument to Dr. Hewitt's accomplishments in what he would have wished to consider his most important life work.—R.M.A.

The Canadian Field-Naturalist

VOL. XXXVI OTTAWA, ONT., NOVEMBER, 1922. No. 8

FURTHER NOTES ON THE *RHOPALOCERA* OR BUTTERFLIES OF HATLEY, STANSTEAD COUNTY, QUEBEC, 1921-1922.

By Henry Mousley

I FIND on reference to my last paper in *The Canadian Field-Naturalist*, Vol. XXXIV, 1920, No. 9, pp. 173-174, on the butterflies of this district, that three new species were added to the already existing list so that the total at the end of the year 1920 stood at forty-eight species, with very little prospects of any new additions in the near future. Certainly I never dreamt that the opening of another season would see not only the addition of a very rare little butterfly to my list, but also some contribution to its life history, which was practically unknown, and that the date upon which it was taken would also prove a record one in these parts. Yet so it was, for on April 30, 1921, (previous earliest date recorded, May 18,) I took a male example of the Early Hairstreak (*Erora læta*) in a little wood near my house, and on May 21, whilst climbing Mt. Orford, (2860 ft.) watched a female deposit an egg on the underside of a beech leaf which I secured. Up to that date the food plant was unknown, and I believe I am the only person who has witnessed the female deposit an egg in the open and amidst her natural surroundings, and seen the resulting larva. For these unexpected pleasures I am greatly indebted to Mr. Albert F. Winn of Montreal, who first drew my attention to *læta*, a fuller account of which, however, will be found in the pages of *The Canadian Entomologist*.

Other additions to my list consist of the Little Sulphur (*Eurema euterpe*), The Banded Hairstreak (*Strymon calanus*), and the Bronze Copper (*Heodes thoe*), all of which have been taken by Mr. Winn at East Bolton (which place comes within my radius) as recorded in his *A Preliminary List of the Insects of the Province of Quebec*, 1912, pp.9-18. At Beebe on July 29, 1922, I secured a number of specimens of the Least Copper (*Heodes epixanthe*), and at Hatley on September 15 a female of the Eastern-tailed Blue (*Everes comyntas*), and these species with *læta* and the other three above named, and the form *violacea* Edw., of the Spring Azure (*Lycænopsis pseudargiolus*) which hardly seems worthy of a name, make a total of fifty-five species and forms for Hatley and district to the end of the present year, 1922.

During the past two seasons there appears to have been a general falling off in the numbers of many of the species here represented, the most notable probably being amongst the Fritillaries. At one time the larger members of this genus such as The Great Spangled Fritillary (*Argynnis cybele*), The Silver-spot Fritillary (*A. aphrodite*) and The Mountain Silver-spot (*A. atlantis*), literally swarmed, but now they are not nearly so plentiful and this remark applies equally well to all the smaller members, more especially, however, to The Baltimore (*Euphydryas phæton*) Nycteis (*Phyciodes nycteis*), and Harris' Checker-spot (*Melitæ harrisi*). Certainly in 1921 I discovered two new stations for the latter near Ayer's Cliff, but only a very few specimens were seen. However, this is somewhat encouraging in view of the fact that it has entirely disappeared from the one and only meadow where I used to find it years ago. The genus *Polygonia* has been very poorly represented ever since 1919, the year in which it was so abundant. No examples whatever have been met with of The Violet Tip (*Polygonia interrogationis*) the largest and handsomest, and very few of the other members have been seen. The Compton Tortoise (*Aglais j-album*) as already mentioned in a previous paper is on the decrease, very few examples having been seen during the past two seasons. The Red Admiral (*Vanessa atalanta*). Hunter's Butterfly (*Vanessa virginiensis*), The Painted Lady (*Vanessa cardui*) and The Wanderer (*Feniseca tarquinius*) have not been seen at all, whilst only two examples of The American Tortoise-shell (*Aglais milberti*) have been noted on August 17 of the present year, 1922. The Pearly Eye (*Enodia portlandia*) has just about held its own, three specimens being seen in 1921, and two in 1922, which is about all I usually meet with in a season. I am afraid as already recorded that the cutting down and burning of all the shrubs on the roadside frequented by The Acadian and Striped Hairstreaks (*Strymon acadica* and *S.*

liparops) in the fall of 1920, has resulted in their extermination, as not a single example has been seen there since. Most of the Skippers were fairly plentiful, but I have no record of having seen The Arctic (*Carterocephalus palæmon*) in either year. In contrast to this apparent falling off in the number of some species may be mentioned the great increase in that of others. Never have I seen so many Tiger Swallow-tails (*Papilio glaucus canadensis*) as this year (1922). They literally swarmed at some of the puddles on the road side, and a photo sent me at the time by a friend who was staying near Metis on the Gaspé coast depicted a similar scene. The other member of the family, The Black Swallow-tail (*Papilio polyxenes*), also appeared in very fair numbers, but the greatest treat of all was the extraordinary abundance of our largest and handsomest butterfly in these parts, the Monarch (*Danaus archippus*) It is now four years since this great migrant paid us a visit, so it can be imagined with what pleasure I again saw it on June 24, from which date its numbers kept increasing until July 21, when I saw ten examples in one afternoon.

On July 10 I watched a female deposit several eggs on the underside of the leaves of the common milkweed (*Asclepias syriaca*), and on July 21 obtained about half a dozen full-fed larvæ from another locality. One of these changed to a chrysalis two days later, and the butterfly emerged on August 6, having been in the chrysalis shape exactly a fortnight. The egg stage of this butterfly is a very short one lasting only about four days. Those mentioned above hatched out in five days. The life history of this beautiful insect is a most interesting one. The butterfly is considered to be polygoneutic, that is to say, many broods are produced annually. Those we get in Canada represent a wave of immigration coming northward from the warmer Gulf States, which lay their eggs as they come. It is not believed that any of them hibernate in any stage of their existence. In the fall they return, sometimes gathering in great swarms on the northern shores of Lakes Erie and Ontario and in southern New Jersey. Within recent years it seems to have effected a settlement in Australia, and has thence spread northward and westward until it has reached Java, Sumatra and the Philippine Islands.

Moving eastward on the lines of travel it has even reached the south of England, where, according to the published records from 1876 (the year in which it was first observed) to 1906, about thirty specimens have been seen or caught, one third of these being obtained in September, 1885. There is no question concerning the migratory habits of this butterfly but just how it reaches England is not definitely known, neither is it known whether upon arrival there it is able to reproduce its kind. It was first observed on the Continent in 1877 at La Vendée, France. In 1886, when half a dozen were recorded from England, single specimens were obtained in Guernsey, Oporto and Gibraltar. It has been taken, I believe, in the Canary Islands, and is well established at the Cape Verde Islands, and possibly by now has invaded Africa, where it would find the family of plants the larvæ feed upon well represented. With such a history behind it, is it possible to gaze upon the insect without experiencing some kind of emotion, and yet it is so, the vast majority of persons paying little or no attention to the beauties around them! Its counterpart, the Viceroy (*Basilarchia archippus*), the most striking case of mimicry which occurs in our fauna, has been seen on many occasions during the past two seasons, the largest specimens of which no doubt are often mistaken by the novice for the Monarch.

In conclusion the more we study nature the more do we see how wonderfully adjusted are her scales, a little increase here, a little decrease there, so that always the balance appears about equal.

THE EUROPEAN HARE IN ONTARIO

BY J. R. DYMOND

THE European Hare is one of the latest additions to the list of species introduced into Ontario from abroad. Its introduction was brought about by Mr. Otto Herold, formerly Manager of Bow Park Farm, near Brantford, Ont. In a letter from Mr. Herold, now of Danzig on the Baltic, he says,

> "In February, 1912, when I was Manager of the Bow Park Farm near Brantford, I imported from Germany seven females and two males. They belong to the species *Lepus timidus* and were exported to the farm by a German zoological exporter.
>
> "When they arrived I kept them fenced in in order to see how they would do in the climate. However, they found a loophole and escaped. In the summer of 1912 we had already found a bunch of young hares. They usually have from two to three young hares about three or four times a year. In Germany the first young arrive in March which usually have young ones again the same year.

"My idea was to keep same on the Bow Park Farm which is nearly surrounded by water of the Grand River. I thought they would stay there but in winter when the ice came they escaped. I had no particular reason for importing them to Canada except that I am a lover of nature, especially harmless, useful animals. . . . Here it is a well known fact that their usefulness exceeds their destructiveness. There is certainly a great industrial value in these hares even if they do eat an occasional cabbage head or a turnip.

If this species is the native hare of Germany as Mr. Herold's letter suggests, it is *Lepus europeus* Pallas. Miller's Catalogue of the Mammals of Western Europe in the Collection of the British Museum gives the range of *Lepus europeus* Pallas, as "Central Europe from Great Britain to Russia and from the Baltic south to the Pyrenees, Italy and Greece" and of the typical subspecies *L. europeus europeus* as "Central Europe from Germany to the Atlantic Coast and from Denmark to Central France." The distribution of *Lepus timidus* Linnaeus, is "Northern portion of Europe and Asia. In Europe throughout Norway, Sweden and Northern Russia, also in Scotland and the Alps. Represented in Ireland by a distinct though nearly related species." Attempts to acclimatize *L. europeus* in Ireland have failed, according to the Cambridge Natural History.

The British Museum Catalogue referred to above gives the distinction between these two species in part as follows:

L. timidus and related forms.—Tail, including pencil, much shorter than hind foot; its upper surface white or clouded with brown or grey, never with clear black median area.

L. europeus and its relatives.—Tail, including pencil, about as long as hind foot; its upper surface with conspicuous clear black median area.

I have not had an opportunity of examining specimens and am anxious to hear from anyone familiar with this animal in Ontario. They are apparently spreading quite rapidly. Last winter they were reported from the Niagara Peninsula, Ingersoll and Guelph. No complaints of their destructiveness have been heard. On the other hand, there is some agitation for their protection because of their value as game.

Since the above was written, the Museum has received from Mr. A. G. Montgomery of Brantford two specimens of this hare. They prove to be *L. europeus* as was expected. Reports of injury to crops have also come from sections where the hares are numerous.

A RECENT BREEDING RECORD OF THE TRUMPETER SWAN IN ALBERTA

BY HOYES LLOYD

IN OCTOBER, 1920, Mr. R. F. Jones, the Manager of the Longfellow Zoological Gardens at Minneapolis, Minnesota, wrote to the Canadian National Parks Branch, Ottawa, asking permission to export a live Swan from Canada, this bird being then in the possession of Mr. L. E. Bodie, of Clairmont, Alberta. Mr. Jones wished to obtain this bird as a mate for one in his possession and upon inquiry stated concerning Mr. Bodie's bird: "It is known as the Trumpeter, or Piping Swan. This is the only species that I have ever been able to secure in the Northwest. They are a large white bird with black feet and bill. Are very tame when domesticated and thus a rarely attractive one."

Possibly ornithologists who have access to Mr. Jones' zoological collection at Minneapolis may be able to record some occurrences of the Trumpeter Swan if they study his specimens and records.

After consulting the Advisory Board on Wild Life Protection the Canadian National Parks refused permission to export this Swan from Canada, at least until its identity was established.

Colonel Perry, Commissioner, Royal Canadian Mounted Police, was furnished with complete descriptions of both Trumpeter and Whistling Swans and plaster casts of the heads of the two species and requested to have one of his officers endeavourto identify the bird in Mr. Bodie's possession.

On January 26, 1921, Sergeant T. C. Davies, in charge of Grande Prairie Detachment of the Royal Canadian Mounted Police, made a patrol to carry out his ornithological mission. He visited the Bodie farm, which is 10 miles west of Clairmont, Alberta, and immediately north of Bear Lake on the south half of Section 3 Township 73, Range 7, West of the 6th Meridian. This is almost 55° North Latitude, 119° West Longitude.

He found that the bird had died on January 14th, and that its body was still in one of the sheds. The officer took the wing measurement as 22½ inches, and found the weight of the frozen body on spring scales to be 19½ lbs.

Extracts from the statement taken by Sergt. T. C. Davies from Mr. Lawrence Bodie are given below:

Clairmont, P.O.
January 26, 1921.

"In July, 1919, I saw a young swan in the shallow waters of Bear Lake, near my father's farm. I went out and caught it with my hands. I would judge it to be about one week old. I brought it home and turned it loose among our chickens. The Swan was never penned up or held in any way, it was always free to come and go as it wished, it would fly 'round the neighborhood but always returned to our farm, it was quite tame and would follow us around.

"I wrote the Game Authorities in Edmonton, asking them for a Permit to have the swan in my possession and also to dispose of it but they informed me that they could not give me any permits. I then tried to get rid of the bird by taking it down to the Lake three miles from the farm and turning it loose, I did this three times but each time it returned to the farm. I then realized that I could not drive it away so let it stay around.

"About three weeks ago I noticed the swan acting as if it had a cold, it seemed to eat well but its breathing was not free and on the 14th of the month I noticed it lying dead in one of the sheds.

"The dead body of the swan is still in my possession. . . .

"I have now turned the body of the Swan over to Sgt. Davies, of the R.C.M.P."

(Signed) L. E. BODIE.

Witness:
T. C. DAVIES,
Sgt., R.C.M.P.

Thus by a strange series of events a specimen of the Trumpeter Swan, *Olor buccinator*, came into the possession of the Branch. The specimen was well prepared by Wolfe & Hine, taxidermists, of Edmonton, and the sternum and trachea were preserved. It is a ♂ and of special interest because it is of known age, namely 17½—18½ months. Consequently, from it the development of convolutions of the trachea at that age may be determined, and it indicates of course, the size, weight, and plumage development of the species at that age.

It furnishes as well a breeding record for the species in the Province of Alberta. The only other published breeding records for the species in that Province of which I am aware are as follows:

April 7, 1891, nest with 5 eggs, at Buffalo Lake; W. E. Raine;[1]

Spring 1885, nest with 4 eggs, at Sounding Lake, recorded by W. E. Raine,[2] on authority of a Mr. Sanderson.

In view of the fact that Coale[3] located only sixteen Trumpeter Swan specimens with authentic data preserved in museums, this specimen will form a valuable addition to the collection in the Canadian National Museum, to which institution it has been presented.

[1]Macoun & Macoun—*Catalogue of Canadian Birds*, 2nd Edition (1909), p. 135.
[2]loc. cit., p. 135.
[3]*The Auk*, Vol. XXXII, pp. 82-90.

MIGRATION OF THE BRANT (*Branta bernicla*) IN GREENLAND

BY DR. MORTEN P. PORSILD,
Direktor, Den Danske Arktiske Station (The Danish Arctic Station), Disko, Greenland.

During the years 1919 and 1920, following the publication by the Dominion Parks Branch of a little brochure on *The Brant of the Altantic Coast*, the writer carried on some correspondence with Dr. Porsild in regard to the migration of the Brant in western Greenland, and, while on a visit to Ottawa in 1922, Dr. Porsild discussed the matter further, consenting to the publication of the notes.

The nomenclature of the species is rather confusing, as many writers do not separate the European bird, *Branta bernicla* (Linn.) from the alleged American subspecies *Branta bernicla glaucogastra* (Brehm.), the latter bird being differentiated as having lighter underparts.

The American Ornithologists' Union Check List (1910) gives *Branta bernicla bernicla* as "Extralimital", and gives the range of *Branta bernicla glaucogastra* (Brehm.) = *Branta glaucogaster* Brehm., Handbuch Vogel Deutschl., 1831, 849 (German coast of Baltic Sea) as follows: "Range—Northern Hemisphere. Breeds on Arctic islands north of latitude 74° and west to about 100°, and on the whole west coast of Greenland; winters on the Atlantic coast from Massachusetts south to North Carolina, rarely to Florida; has been recorded in the interior from Manitoba, Ontario, Colorado, Nebraska, Wisconsin, Michigan, Indiana, and Louisiana; accidental in British Columbia and Barbadoes."

Professor W. W. Cooke, in his *Distribution and Migration of North American Ducks, Geese, and Swans*, U.S. Dept. of Agriculture, Biological Survey, Bulletin No. 26, 1906, under *Branta bernicla glaucogastra* (Brehm.) White-bellied Brant," states: "The eastern brant breeds on the west coast of Greenland from Frederikshaab, latitude 62°, northward probably as far as land extends, certainly as far north as the north shore of Grinnell Land, latitude 82° 33′, etc., etc."

Other authors state that in Spitsbergen and northern Europe both light and dark-bellied birds are found. Hartert, *Scottish Naturalist*, 1917, considers that *Branta bernicla* (*Branta bernicla glaucogastra*) is a dimorphic form; if the American bird is separable it is *Branta bernicla collaris* (Brehm.)

In a letter to Dr. Porsild on February 27, 1920, the writer stated: "The bulk of the American birds at least, according to the authorities, seem to be of the light-bellied form. The natural route of migration would be for many of these birds to migrate north from Labrador to the west side of Greenland. Probably a good many European birds (Brant) come from Europe to east Greenland by way of Iceland, and no doubt some of them get across to West Greenland. It would seem more natural, however, for such birds to go north along the coast of East Greenland instead of swinging south around the southern end of Greenland or perhaps crossing over the center

of Greenland in a southwesterly direction. It would seem quite possible for Brant to come up along the west coast of Greenland, following the coast pretty closely and, after striking the south side of Disko island, to swing around so as to come from the northeast in the locality of Godhavn. The Black Brant of the western Arctic, so far as my observations go, seem to follow the coast line pretty closely in their migrations, though of course when necessary to 'make a passage' across a strait they are not averse to doing so. I think a good deal of the confusion about American and European forms of the same species is due to not having enough specimens together from both sides of the Atlantic. The European museums have large series of European birds and the American museums have the American-taken specimens, and seldom is there an opportunity to examine both sets of specimens side by side."—R. M. ANDERSON.

WHAT I know about the Brant in Greenland is not much beyond what has been written by H. Winge in his excellent "Grönlands Fugle", *Meddelelser om Grönland* 21, 1898. My tsation, is situated near the colony of Godhavn on South Disko. This place is one of the very few spots known to me in Greenland regularly touched by migrating Brants. As a joke I used to say: "The Brants are coming June 3rd at 6 o'clock p.m." and, in fact, during the thirteen years of my residence at the place, the first Brants were seen from *June 1st to 3rd without any regard to weather conditions.* I do not know where they cross Disko Bay; to us they come from northeast, flying along the steep wall of the basalt mountain "Skarvefjaeld". Leaving the shore here, they cross the small "Sortesandsbugt" along the border of the last winter ice, steering straight to Upernavik naze, where the natives shoot at the flocks.

The neck of Godhavn Peninsula between the Harbour and Sortesandsbugt is very low and sandy. If they would fly over that neck every one would escape from the shooting, but they never do. The flocks are usually very great, from one to several hundreds each, and normally several hundred thousand Brants pass us every year. Some years, however, the number is much smaller.

Curious is the varying of the dates for migration Now the date is as said about the 3rd of June. In the years about 1812 they came the last days of May, about 1840 the date was between the 8th and 12th of June, and in 1882 the dates were 8th to 11th June. Each of the years mentioned does not mean that single year,but a series of subsequent years of varying number.

I have hitherto applied in vain to the natives for other migration stations than this; only casually small flocks or single stragglers were observed. They are often seen on Northeast Disko, and one of my informants believes that they nest there. But as that region is uninhabited and very rarely visited I doubt the correctness of the statement. North of the 73rd parallel nests were known in former times. Now I think nests do not occur except at Smith Sound, and Mr. W. Elmer Ekblaw, member of the Crocker Land Expedition, told me that nests were comparatively scrace on the north coast of Greenland, whereas Ellesmere Land and Grant Land were the veritable El Dorado of the Brant.

Once I succeeded in getting a live pair on North Disko in August. The female had a broken wing and the male could not or would not quit her, so my Eskimo companion ran them down and caught them. I had them in my boat some fourteen days, until I got home. They were very greedy and I fed them with everything obtainable, but mostly with *Equisetum arvense.* After my return the female drowned by an accident and the male was killed when the frosts came.

I (formerly) believed that the Brant wintered in Europe only, and not in America. and it was to me a favourite object for fairy tales to children: the Brants coming June the third, steering straightway from Europe through snow and gales to our little naze and building their nests on far Ellesmere Land were most fascinating. Now I see that they do winter in America, the story becomes a little less fascinating, but more natural.

When I come back, I shall try to send out question schedules over the whole of West Greenland; our Eskimo are intelligent and interested observers. If I succeed in getting some valuable information about the tracks of the Brant, I shall send it to you.

Copenhagen, April 8, 1920

As much has been published since the book by Herluf Winge on the Birds of Greenland in 1898, I went today to Mr. Winge to get information from our first authority. Winge considers all Brants from East as well as West Greenland to be the same race, namely, the light-bellied *glaucogastra*, and he does not doubt that all Greenland Brants migrate to America and not to Europe. About the racial value of the *glaucogastra*, Mr. Winge was rather uncertain. Ordinarily he is rather conservative in taxonomy.

I think the statement by Cooke, quoted by you, as to the breeding of the Brant down to 62° in West Greenland is wrong. It does breed at 73°, but only casually, and as far as I know, partially from verbal information by Mr. Ekblaw only a few birds breed in the northernmost part of Greenland, whilst Ellesmere Land is the great breeding place for the millions of Brants passing us.

BIRDS OF A SUBURBAN GARDEN

BY R. OWEN MERRIMAN.

EVER since the days of Rev. Gilbert White, observers have realized the importance of records of the natural history of limited areas; and in ornithology local lists have been made and published for very many localities. These lists are nearly all for comparatively large areas, a farm of many acres being the smallest area which observers seem inclined to treat as a unit. The writer and his neighbor, W. F. Ambrose, having been compelled for reasons of health to limit their observations chiefly to one garden, have been pleased to find the list of species identified within its boundaries grow to unexpected dimensions; and they have wondered whether their location is especially favorably situated for such observations or whether similar lists could be made for other areas of similar size. Those who have kept records for small gardens may be glad to compare this list with theirs, as the writer would certainly be glad to do.

This garden is situated in a suburb of Hamilton, Ontario, Canada, on the Niagara escarpment, and about three hundred yards south of its edge, two hundred and fifty feet above the level of Lake Ontario. The escarpment here forms the south limit of the city of Hamilton, which lies below and extends northward to its harbour, two miles away. The land on the top of the escarpment is gently rolling; and is partly built up for half a mile from the edge. This suburban district has many trees; but to the south the farm lands have few orchards and fewer wood-lots. The nearest water is a small stream a mile away. On three sides of this garden there are houses within one hundred feet; but on the west there are only one or two houses within a quarter of a mile. On this side lies a meadow, beyond which runs a long private avenue of Norway spruce, horse-chestnut, maple and elm. To this open, quiet space, and to the fact that there is little traffic on the street to the east of the garden, much of its attractiveness to birds may be due.

The garden itself is a rectangle, two hundred and fifty feet by one hundred and sixty feet, or about five-sixths of an acre. Near the north boundary is a large brick house with a small outhouse; and near the middle of the west boundary is a small, low cottage. On the north half of the area are eighteen small trees, maples, horse-chestnuts, one Lombardy poplar, and fruit-trees; and around the house are a few shrubs, three clumps of staghorn sumach (*Rhus typhina*) meriting special notice. A few flowers and vegetables are also grown. The grass on the north half of the area is kept as a mown lawn, but on the south half most of it is cut only once during the summer. Overhanging the roof of the above-mentioned cottage is the only large tree in the area, a white oak; and nearby is a ten-year-old elm. Along the south boundary is a widely-spaced row of Norway spruce. The most important feature of the garden is a thicket which extends along the west boundary, forming the south end of a thicket which follows this fence for nearly two hundred yards. This thicket, here about twenty feet wide and fifteen feet high, is composed chiefly of wild plums, but includes seedling pear and cherry trees in bearing, many seedling maples, wind-sown from a tree just over the west edge of the area, sweet brier and rugosa roses, and bittersweet and Virginia creeper climbing some of the trees. The thicket is not pruned or raked, the carpet of leaves and the many dead twigs and branches proving definite attractions. It is in this thicket that most of the observations are made, especially during the seasons of bird migration.

During the winter, supplies of food are available in the area for such species as will accept them. Sumach and bittersweet have been mentioned already. Two inverted feeding-boards built after the design of W. E. Saunders are kept filled with seeds and suet, and seeds and table-scraps are sprinkled on the ground. House Sparrows are discouraged with trap and gun. It is during the spring migration that the largest number of species is observed; but all that can be done to encourage the visits of migrants is to keep the garden as quiet as possible, to delay raking and other gardening, and to discourage the visits of neighbors' cats. In May it is not unusual to observe twenty species in the garden in one day; and in five hours on May 20, 1920, thirty-four species were identified by one observer while seated in one spot. During the breeding season, nesting material attracts some individual birds; and nesting-boxes of various sizes have been erected in suitable sites The two bird-baths which are kept filled in all but freezing weather are known to have been used by about twenty species; by some only for drinking. Far fewer birds are recorded during the fall migration than during the spring, partly because of the greater difficulty of distinguishing between similar species in fall plumage, and partly because the trees are in fuller leaf.

The observations on which the following list is based were begun in 1907; but at first records were kept only in a sketchy fashion. As the knowledge of the observers grows, they find greater interest in referring to their records, which are being made with increasing attention to detail. In compiling the list, no species has been included unless identified as positively as is possible by sight alone; and care has been taken especially to remove all doubtful records of species not usually seen in the vicinity.

1. *Larus argentatus.* HERRING GULL.—Flocks of fifteen or less frequently seen flying overhead in winter and spring, in search of food among manure on fields. These flocks may also include *L. delawarensis* as these two species are found together on Lake Ontario in spring.

2. *Branta canadensis canadensis.* CANADA GOOSE.—Flocks rarely seen flying over in spring and fall. One record of two flying about twenty feet above ground into gale and snow-storm. Flocks of unidentified Ducks regularly fly over in spring and fall.

3. *Ardea herodias herodias.* GREAT BLUE HERON.—One bird observed flying over.

4. *Oxyechus vociferus vociferus.* KILLDEER.—Abundant summer resident in the vicinity.

5. *Bonasa umbellus togata.* CANADA RUFFED GROUSE.—One seen in May, 1915, later found dead. Now rare in vicinity.

6. *Accipiter velox.* SHARP-SHINNED HAWK.—Rarely seen.

7. *Falco sparverius sparverius.* SPARROW HAWK.—Rarely seen. Hawks are frequently seen soaring and sailing overhead in summer, not identified further than as belonging to the genus *Buteo* or genus *Archibuteo.*

8. *Cryptoglaux acadica acadica.* SAW-WHET OWL.—Flock of five or six seen. June 26, 1921.

9. *Otus asio asio.* SCREECH OWL.—Heard frequently throughout the year, but seldom seen. Other Owls occasionally heard.

10. *Coccyzus americanus americanus.* YELLOW-BILLED CUCKOO.—Seen every year, but infrequently.

11. *Coccyzus erythrophthalmus.* BLACK-BILLED CUCKOO.—Seen occasionally every year.

12. *Dryobates villosus villosus.* HAIRY WOODPECKER.—Seen every winter, in some winters a regular visitor at feeding stations.

13. *Dryobates pubescens medianus.* DOWNY WOODPECKER.—Common throughout the year. At feeding station regularly in winter and occasionally, with young, in summer.

14. *Sphyrapicus varius varius.* YELLOW-BELLIED SAPSUCKER.—Not common, but recorded every spring.

15. *Melanerpes erythrocephalus.* RED-HEADED WOODPECKER.—Common summer resident.

16. *Colaptes auratus luteus.* NORTHERN FLICKER.—Very common summer resident. One visited feeding station regularly through the winter of 1919-1920.

17. *Antrostomus vociferus vociferus.* WHIP-POOR-WILL.—Heard occasionally every year, usually in May.

18. *Chordeiles virginianus virginianus.* NIGHTHAWK.—Very common in summer. Breeds in the city of Hamilton.

19. *Chaetura pelagica.* CHIMNEY SWIFT.—Very common in summer.

20. *Archilochus colubris.* RUBY-THROATED HUMMINGBIRD.—Very common in summer.

21. *Tyrannus tyrannus.* KINGBIRD.—Common in summer.

22. *Myriarchus crinitus.* CRESTED FLYCATCHER.—Seen regularly in spring and rarely in summer.

23. *Sayornis phoebe.* PHOEBE.—Seen frequently in spring and fall, but not often in summer.

24. *Myiochanes virens.* WOOD PEWEE.—Fairly common in summer.

25. *Empidonax flaviventris.* YELLOW-BELLIED FLYCATCHER.—Regular spring migrant, rather rare.

26. *Empidonax minimus.* LEAST FLYCATCHER.—Common in summer.

27. *Cyanocitta cristata cristata.* BLUE JAY.—Common all year. Visits feeding station in winter.

28. *Perisoreus canadensis canadensis.* CANADA JAY.—Very few records. Seen in vicinity almost every winter.

29. *Corvus brachyrhynchos brachyrhynchos.* CROW.—Common except in January, when few are seen.

30. *Dolichonyx oryzivorus.* BOBOLINK.—Common in spring and early summer.

31. *Molothrus ater ater.* COWBIRD.—Common in summer. Young usually fostered by Song Sparrows.

32. *Agelaius phoeniceus phoeniceus.* RED-WINGED BLACKBIRD.—Very few records, though not uncommon in the vicinity.

33. *Sturnella magna magna.* MEADOWLARK.—Common in summer.

34. *Icterus galbula.* BALTIMORE ORIOLE.—Fairly common in summer.

35. *Euphagus carolinus.* RUSTY BLACKBIRD.—Very large flocks, including this and other species, of Blackbirds gather in Dundas Marsh three miles to the north-west in the fall, flying over the area at sunrise and sunset on the way to and from feeding in stubble and ploughed fields.

Also occasionally recorded in trees in the area.

36. *Quiscalus quiscula æneus.* BRONZED GRACKLE.—Very common in summer. Less common during last two years than formerly, though apparently increasing in the city.

37. *Hesperiphona vespertina vespertina.* EVENING GROSBEAK.—Flock of eight or ten frequently visited the garden in January, 1920, feeding on staghorn sumach.

38. *Pinicola enucleator leucura.* PINE GROSBEAK.—One March record of a flock of about twenty-five.

39. *Carpodacus purpureus purpureus.* PURPLE FINCH.—Rare in area but not uncommon spring and fall migrant in vicinity.

40. *Passer domesticus domesticus.* HOUSE SPARROW.—A pest!

41. *Astragalinus tristis tristis.* GOLDFINCH.—Very common in summer, often nesting in the area. Flock occasionally seen in winter.

42. *Spinus pinus pinus.* PINE SISKIN.—Regular early spring migrant.

43. *Passerculus sandwichensis savanna.* SAVANNAH SPARROW.—One record. Common summer resident in vicinity.

44. *Zonotrichia leucophrys leucophrys.* WHITE-CROWNED SPARROW.—Regular spring migrant, not common.

45. *Zonotrichia albicollis.* WHITE-THROATED SPARROW.—Regular migrant, very common in spring, less common in fall.

46. *Spizella monticola monticola.* TREE SPARROW.—Rare winter visitor. Not uncommon in vicinity.

47. *Spizella passerina passerina.* CHIPPING SPARROW.—Very common in summer, nesting in area.

48. *Spizella pusilla pusilla.* FIELD SPARROW. Spring migrant, only a few records.

49. *Junco hyemalis hyemalis.* SLATE-COLORED JUNCO.—Common in spring and fall, and in some years also common in winter at feeding station.

50. *Melospiza mleodia mleodia.* SONG SPARROW. —Very common in summer, regularly nesting in area.

51. *Melospiza georgiana.* SWAMP SPARROW.—One record. Not uncommon in certain localities within a few miles.

52. *Passerella iliaca iliaca.* FOX SPARROW.—Regular spring migrant. During the last two years common both spring and fall.

53. *Pipilo erythrophthalmus erythrophthalmus.* TOWHEE.—Regular spring migrant, rather rare in area though not uncommon in vicinity.

54. *Zamelodia ludoviciana.* ROSE-BREASTED GROSBEAK.—Seen once or twice almost every spring.

55. *Passerina cyanea.* INDIGO BUNTING.—Formerly seen frequently, but rarely seen in last ten years though still a common summer resident within a mile. Perhaps influenced by the building up of this neighborhood.

56. *Piranga erythromelas.* SCARLET TANAGER. —Usually seen once or twice each spring.

57. *Progne subis subis.* PURPLE MARTIN.—Common in summer.

58. *Hirundo erythrogaster.* BARN SWALLOW.—Fairly common in summer. More common prior to about 1910 than now.

59. *Bombycilla garrula.* BOHEMIAN WAXWING —Two winter records.

60. *Bombycilla cedrorum.* CEDAR WAXWING. —Seen irregularly throughout the year in flocks of from ten to fifty.

61. *Lanius borealis.* NORTHERN SHRIKE. —One winter record.

62. *Vireosylva olivacea.* RED-EYED VIREO.—Seen throughout every summer.

63. *Vireosylva gilva gilva.* WARBLING VIREO. —Regular but rather rare spring migrant; also occasionally seen in fall.

64. *Lanivireo solitarius solitarius.* BLUE-HEADED VIREO.—Three records in spring and two in fall.

65. *Mniotilta varia.* BLACK AND WHITE WARBLER.—Common in spring and fall, occasionally seen in summer.

66. *Vermivora ruficapilla ruficapilla.* NASHVILLE WARBLER.—One or two seen each spring recently.

67. *Compsothlypis americana usneae.* NORTHERN PARULA WARBLER.—Several spring records but none since 1919.

68. *Dendroica tigrina.* CAPE MAY WARBLER. —Several spring records in recent years.

69. *Dendroica aestiva aestiva.* YELLOW WARBLER.—Very common in summer. Nests abundantly in immediate neighborhood.

70. *Dendroica caerulescens caerulescens.* BLACK-THROATED BLUE WARBLER.—Very common migrant in spring and fall.

71. *Dendroica coronata.* MYRTLE WARBLER. —Regular spring and fall migrant.

72. *Dendroica magnolia.* MAGNOLIA WARBLER.—Very common spring and fall migrant.

73. *Dendroica cerulea.* CERULEAN WARBLER. —One record in spring, April 25, 1921; bird identified with 3X prism binoculars at thirty feet in excellent light. Rare migrant in vicinity.

74. *Dendroica pensylvanica.* CHESTNUT-SIDED WARBLER.—Common spring migrant, very few fall records.

75. *Dendroica castanea.* BAY-BREASTED WARBLER.—Uncommon spring migrant.

76. *Dendroica striata.* BLACK-POLL WARBLER.—One or two seen each spring.

77. *Dendroica fusca.* BLACKBURNIAN WARBLER.—Regular spring migrant, one fall record.

78. *Dendroica virens.* BLACK-THROATED GREEN WARBLER.—Uncommon spring migrant, one fall record.

79. *Dendroica vigorsi vigorsi.* PINE WARBLER.—Only one spring record for area. Regular migrant in vicinity, but probably influenced by absence of pine trees from the area and its immediate neighborhood.

80. *Dendroica palmarum palmarum.* PALM WARBLER.—Two spring records.

81. *Dendroica discolor.* PRAIRIE WARBLER.—One spring record, May 12, 1920, when distinctive marks on back clearly seen with 6X prism binoculars, bird under observation for several minutes in good light. Very rare in vicinity.

82. *Seiurus aurocapillus.* OVEN-BIRD.—Common in migration. Sometimes breeds in vicinity

83. *Seiurus noveboracensis noveboracensis.* WATER-THRUSH.—One spring record.

84. *Geothlypis trichas trichas.* MARYLAND YELLOW-THROAT.—Common spring migrant.

85. *Wilsonia pusilla pusilla.* WILSON'S WARBLER.—Records only for spring in last two years. Regular migrant in vicinity.

86. *Wilsonia canadensis.* CANADIAN WARBLER—Common in spring, seen also in fall, one August record.

87. *Setophaga ruticilla.* REDSTART.—Very common in spring, and also seen in fall.

88. *Dumetella carolinensis.* CATBIRD.—Common in summer. breeding in immediate neighborhood.

89. *Toxostoma rufum.* BROWN THRASHER.—Common in spring.

90. *Troglodytes aedon aedon.* HOUSE WREN.—Very common in summer, two to four broods being raised each year in the area.

91. *Nannus hiemalis hiemalis.* WINTER WREN.—Spring records in three recent years.

92. *Certhia familiaris americana.* BROWN CREEPER.—Common spring and fall migrant, occasionally seen in winter.

93. *Sitta carolinensis carolinensis.* WHITE-BREASTED NUTHATCH.—Usually common in winter and seen throughout the year. Visits feeding station regularly in winter, and occasionally, with young, in summer.

94. *Sitta canadensis.* RED-BREASTED NUTHATCH.—Fairly common in spring and fall migrations.

95. *Penthestes atricapillus atricapillus.* CHICKADEE.—Common in winter, seen throughout the year. Visits feeding station commonly in winter, and occasionally, with young, in summer.

96. *Regulus satrapa satrapa.* GOLDEN-CROWNED KINGLET.—Common spring and fall migrant, occasionally seen in winter.

97. *Regulus calendula calendula.* RUBY-CROWNED KINGLET.—Very common spring and fall migrant.

98. *Hylocichla mustelina.* WOOD THRUSH.—Rare spring migrant in area. Occasionally breeds in vicinity.

99. *Hylocichla fuscescens fuscescens.* VEERY.—Regular visitor in spring. Not seen in the area in summer, though breeding regularly within one mile.

100. *Hylocichla aliciæ aliciæ.* GRAY-CHEEKED THRUSH.—Occasionally identified in spring and fall.

101. *Hylocichla ustulata swainsoni.* OLIVE-BACKED THRUSH.—Common migrant in spring and fall.

102. *Hylocichla guttata pallasi.* HERMIT THRUSH.—Common migrant in spring and fall.

103. *Planesticus migratorius migratorius.* ROBIN.—Very common in summer, breeding regularly within the area. Sometimes a few winter in the vicinity.

104. *Sialia sialis sialis.* BLUEBIRD.—Common in summer, breeding within the area.

FURTHER NOTES ON THE FERNS OF HATLEY, STANSTEAD COUNTY, QUEBEC, 1921-1922.

BY HENRY MOUSLEY

IN MY previous paper on the ferns of this district, *The Canadian Field-Naturalist*, Vol. XXXIV, 1920, No. 7, pp. 137-140, I find that forty-one species and varieties were recorded. To this number may now be added the following, viz: *Thelypteris spinulosa, Thelypteris Boottii* var. *multiflora* Dav.; *Botrychium lanceolatum* var. *angustisegmentum; Woodsia ilvensis; Cryptogramma Stelleri*, and *Asplenium Trichomanes*, these six now bringing the total up to forty-seven species and varieties to the end of the present year, 1922, fuller particulars of which will be found

in the annotated list which follows hereafter. In addition to these forty-seven species and varieties, there are several interesting hybrids of the *Thelypteris* (*Dryopteris*) family, which, thanks to the help of Dr. Philip Dowell (who has made a special study of them), I am able to include here, viz: *T. Clintoniana* x *Goldiana*, *T. cristata* x *Goldiana?* *T. Clintoniana* x *marginalis?*, *T. cristata* x *marginalis?*. It has been thought advisable to place a note of interrogation after the last three, in view of the fact that there is still some uncertainty as to whether they are Clinton crosses or crested crosses. It is indeed no easy matter in some cases to make absolute definite determinations with regard to these hybrids. but looking to the fact that *cristata* is far more numerous than *Clintoniana* it is more than probable that they are crosses by the first named, although I should not be surprised if they all occur here.

It will no doubt be remembered that I drew attention to the fact of the scarcity in my list of purely rock-loving ferns, due to the fact of the rocky localities lying at some distance from Hatley, and my inability to visit them very often. In order to see approximately what rock species might reasonably be expected in this district, I consulted the lists of the most famous localities in the state of Vermont (which adjoins our County of Stanstead), such as Willoughby Lake, Dorset, Manchester, and Pittsford, from which I gathered that the following species had been taken in most of them, and might reasonably be looked for here, viz.: *Pellæa atropurpurea*, *Cryptogramma Stelleri*, *Asplenium viride*, *Asplenium Trichomanes*, *Asplenium Ruta-muraria*, *Camptosorus rhizophyllus*, *Woodsia ilvensis*, and *Woodsia alpina*. Of these eight species, I have this season (1922) found the following three, viz: *Cryptogramma Stelleri*, *Asplenium Trichomanes*, and *Woodsia ilvensis*. Assuming it possible to obtain the remaining five (which I am afraid is not very likely) Hatley would then have a list of thirty-seven true ferns, or a lead of one over Willoughby Lake which nowheads the list with thirty-six species, having only just recently attained to this honour by the discovery there on July 4, 1921 of *Athyrium angustifolium* by Mr. E. J. Winslow, who speaks of this as being the farthest northeast station so far known to him for this species. Evidently he is unaware of my having found the species here at Hatley, but only in one wood. Another station, however, was discovered at Ayer's Cliff (about seven miles from Hatley) by a lady during the present summer (1922), but only a very few plants were noted, not more than four I think. With the addition of *Thelypteris spinulosa*, *Cryptogramma Stelleri*, *Asplenium Trichomanes*, and *Woodsia ilvensis*, the list of true ferns found at Hatley now stands at thirty-two species, or four behind that of Willoughby Lake. My first real fern hunt for the season of 1922 took place on June 26, when I climbed Mt. Orford (2860 feet) for the third time since 1918. The principal object of the present ascent was to determine definitely the identity of a fern I had found at the summit on May 21, 1921, the fronds of which were only just uncurling at that date, and also to try and add some of the rock species to my list. In this I was successful, as *Woodsia ilvensis* fell to my lot, and the species at the sumit was found to be *Thelypteris spinulosa* var. *americana*, of which there were several large beds in full fruit. On the way down I came upon one plant of Braun's Holly Fern (*Polystichum Braunii*), thus adding a second station for this interesting species. As already intimated I feel sure this mountain will well repay systematic working. The area is a very large one, the long spurs leading to the summit would alone take many days to examine, and then there are numerous other rocky points all around the base. I only wish I could spend several weeks in the neighborhood, as the results I have so far obtained on flying visits are sufficient to make me optimistic. My next outing was on July 6th when I climbed Barnston Pinnacle (2150 ft.), the results of which were very disappointing. Certainly I found two interesting wild flowers on the summit, one of them being the Pale Corydalis (*Corydalis sempervirens*) which was new to my list, and the other the Three-toothed Cinquefoil (*Potentilla tridentata*) which I had previously found there in 1918, this being the only station I know of for the species. Concerning the ferns I can chronicle little of interest, except the fact that the Common Polypody did not belie its name. Previously I had found it in very small quantities in some five or six stations, but here it covered all the huge granite boulders at the foot of the Pinnacle, as well as being generally distributed everywhere. Other visits I hope may prove more remunerative, as of course I was only able to cover a very limited area in the time at my disposal. On the eleventh I was unexpectedly able to pay the big gorge at Coaticook a flying visit of an hour's duration only, which time was spent in locating the most suitable place for entering it, the river being deep in places and the sides perpendicular. Incidentally I found a fine cluster of that interesting little wild flower, the Harebell (*Campanula rotundifolia*), with which I was well acquainted in England, but which I had, so far, never come across in this country.

At the end of the month I paid Burrough's Falls a visit and, this being a small area, I was

enabled to examine carefully all the rocks, with no better results than on a former occasion (already reported), when nothing but the Bulblet Bladder Fern (*Cystopteris bulbifera*) could be found. The only item of interest was the locating again of a few plants of the Harebell, which my younger son had previously informed me he had seen in 1919. The following day (July 31) I went to Ayer's Cliff, and searched the rocks all around that part of Lake Massawippi known as Elmwood Park on the southern shore. Here again the Bulblet Bladder Fern was the only one in evidence, and as I unexpectedly had the opportunity of a ride to Burrough's Falls, I decided to visit that locality again, and explore the sides of the river to the south of the Falls. This was a lucky move, indeed, for I eventually came upon several large patches of that delicate little fern, the Slender Cliff-Brake (*Cryptogramma Stelleri*.)

I had almost forgotten to mention that, previous to my visit to Burrough's Falls, I spent the day of July 21st on the eastern shore of Lake Massawippi visiting Perkin's Point and the site of that rare little fern, the Smooth Woodsia (*Woodsia glabella*), which I discovered in 1920. Imagine my feelings on finding that a landslide had taken place since then, and had swept most of the largest plants away. The elevation of this site is about 550 feet above sea level, or barely half that of *Woodsia ilvensis* found on Mount Orford on June 26th. At one point on the shore I came across quite a large colony of the so-called var. *obtusilobata* of the Sensitive Fern (*Onoclea sensibilis*), with leaves in all stages of transition. As these leaves merely represent the transition from the usual sterile leaf to the fully fledged sporophyll, they should obviously bear no distinctive name.

It was not until September 19th that I again took the field in a systematic hunt for rock ferns, the locality this time being the big gorge at Coaticook. Here I came across *Cryptogramma Stelleri* and *Woodsia ilvensis*, and again three days later obtained *Asplenium Trichomanes*. In my last paper I find I omitted to mention Owl's Head (2484 feet) as being a likely place for rock ferns. This mountain is situated on the western shore of Lake Memphremagog about eighteen miles to the west of Hatley, and is of a rocky nature, but unfortunately I have not been able to visit it so far. The shores of this lake are also rocky in places, and would no doubt yield good results if properly worked. I think the foregoing notes about sum up the principal events of the seasons 1921-1922, so I will now proceed with the annotated list of the new species discovered, which have only been casually referred to so far.

SPINY SHIELD FERN (*Thelypteris spinulosa*).—This species was really discovered on August 27, 1919, but omitted from the 1920 list pending exact determination.

Thelypteris Booltii var. *multiflora* Dav.—This variety of Boot's Shield Fern was likewise discovered on August 27, 1919, but was not sufficiently identified for inclusion in the 1920 list. It was described by Davenport and is a robust form of the ordinary *T. Booltii*, which Dr. Philip Dowell (who kindly verified it for me) considers under less favourable conditions would not differ from the less robust.

THE LANCE-LEAVED GRAPE FERN (*Botrychium lanceolatum* var. *angustisegmentum*).—Although this species has not yet been found by myself, there is a record of it from Magog (Goode), and as this place comes within my area it has been included: see *Catalogue of Canadian Plants*, John Macoun, 1890, pt. 5, p. 255.

THE RUSTY WOODSIA (*Woodsia ilvensis*).—The first sight of this woolly little species is not likely to be easily forgotten. Often it is found on the exposed crests of precipices and similar dangerous places, growing in the full glare of the sun. Luckily for me, however, the site on Mt. Orford where I first found it on June 26, 1922, was a very easy one to reach, being a ledge of rock about my own height, on the top of which were several young plants growing together in close mats, the young croziers being covered with silvery white hairlike scales, which were in pleasing contrast to the darker green of the more mature fronds. The ledge was in a shady spot just off the trail, and roughly about 1,200 feet above sea level. Time would not allow of a systematic search being made, so I am unable at present to give any idea of its abundance or otherwise, but judging from the look of the surrounding rocks it may eventually be found in some quantity. On this occasion I located only about half a dozen plants, or rather mats, as no single plant grew separately. The site in the gorge at Coaticook was a very different one from that on Mt. Orford, being a cleft in the rock at the very top of the gorge, and in the full glare of the sun, the elevation being roughly about 800-900 feet above sea level. There was only one little cluster or mat consisting of about half a dozen very small plants, none of which exceeded four inches in height, and which I at first took to be *Woodsia alpina*. How we all like to imagine we have found the rarer of any two species which nearly resemble one another!

THE SLENDER CLIFF-BRAKE (*Cryptogramma Stelleri*).—This frail and delicate little fern was discovered growing on the banks of the river Nigger, about half a mile to the south of Bur-

rough's Falls on July 31, 1922. Viewing the spot from a distance, I at once seemed to know (one acquires this gift after years of field work) that here lay some secret hidden away. Everything pointed to it, the very lay of the land, the river with its rocky bed and steep-sloping, well-wooded sides, seemed to proclaim the fact. And yet it was some time before nature gave up her secret, for the very young fronds of the Bulblet Bladder Fern (*Cystopteris bulbifera*) are not unlike the sterile ones of *C. Stelleri* especially when seen growing at some height above one's head. I started work on the right bank of the river, but at first noticed nothing but *C. bulbifera* (the same as at the Falls), until a crevice in the rock high up attracted my attention, and I said, almost involuntarily, "There's *Stelleri*." I had caught sight of a fruiting frond, luckily, otherwise it was almost impossible, at the distance they were from me, to distinguish the sterile fronds from those of *C. bulbifera*, which were growing adjacent to them. Had I known it, I might have saved myself a good deal of trouble in securing this specimen, as I afterwards found several good beds of it on the opposite bank, and obtained specimens in all stages, from the young primordial leaf, with one or more large segments, to the mature, with many and small segments. Fruiting fronds were not at all plentiful, in fact they were scarce. In contrast to the abundance of the species at the Falls, the scarcity in the gorge at Coaticook was very marked. Here only a very few plants were found, and the small colony seemed in imminent danger of being swept away at no late date by a landslide, which was apparently developing higher up.

In conclusion I should say that it is my intention to present pressed examples of all the ferns enumerated in my papers to the National Herbarium of Canada, Victoria Memorial Museum, Ottawa. This was partly accomplished in February, 1921.

WILLET CENSUS IN NOVA SCOTIA

BY R. W. TUFTS

DURING the summer of the current year (1922) a careful survey was made of the breeding range of the Willett in Nova Scotia. This was undertaken under the direction of the Canadian National Parks Branch with a view to ascertaining as nearly as possible the number of these birds which still nest in this province.

Several specimens which were taken from here were examined by Dr. C. W. Townsend of Boston and were subsequently classified by him as the Eastern Willett (*Catoptrophorus semipalmatus semipalmatus*) which at one time bred along the Atlantic seaboard from Nova Scotia to the Gulf of Mexico. As a result of various forms of persecution, which the species was not able to withstand, this breeding range, so far as known, is now restricted, north of Virginia, to the four western counties of Nova Scotia. Since it is not found inland, usually preferring extensive salt-marsh areas and adjacent uplands, it will be seen that the task of numbering the individuals is not as hopeless as it might at first appear. During the period when this estimate was being made there was considerable rain and fog which made it difficult to see the birds except at close range; but on the other hand it was undertaken at a time when the young were newly hatched and both parent birds were therefore much in evidence. They breed in small colonies or isolated pairs, the nest being concealed in the thick grass and low bushes near the edge of the tide or well hidden in the upland pastures adjacent to the marshes. An allowance of three young per pair was made so that the figures which follow represent approximately the actual number, adult and young, at the end of the breeding season, and in submitting them the writer has endeavored to err on the side of conservatism. The area more definitely described includes the favorable coastal districts from St. Mary's Bay in Digby County south through Yarmouth and thence south-east through Shelburne as far as Port Mouton in Queen's County.

HEAD OF ST. MARY'S BAY, DIGBY CO. 100
This colony is readily counted with a fair degree of accuracy owing to the nature of the country and the fact of its comparative isolation from other Willet grounds. The birds in this area appear to show a steady increase during the past decade.

GROSSES COQUES, DIGBY CO. 50
The numbers here this year are disappointing in comparison with those of recent years.

CHURCH POINT, DIGBY CO. 20
There appears to be a new colony springing up here.

CHURCH POINT TO SALMON RIVER, DIGBY CO. 16

A few scattered pairs noted along this stretch of marshland.

CHEBOGUE TO LITTLE RIVER, YARMOUTH CO. 200

This section is no doubt the best favored in the province for the birds. The marshes are numerous and intricate. Birds in small colonies and scattered pairs were noted at many points. Natives here, with whom the question was discussed, contend that the Willets have increased during the past decade or two.

TUSKET MARSHES TO SURETTE'S ISLAND, YARMOUTH CO. 150

No colonies but birds common over entire area.

ARGYLE TO VILLEGADALE (*Villagedale is in Shelburne Co.*) 100

Isolated pairs in many small marshlands rather widely separated for the most part.

VILLAGEDALE TO PORT MOUTON, *which is in Queen's Co.* 100

The district between these points is similar to the above, there being no extensive areas of marshland.

Total 736

BIRD NOTES FROM THE DISTRICT OF ALGOMA, ONTARIO

BY M. J. MAGEE.

DURING the period August 2 to 6, 1922, I was on a fishing trip to some small lakes back of Goulais Bay, Lake Superior, some 20 miles nearly north of Sault Ste. Marie, Ont. The trip was made by auto to within a mile and a half of the first lake and the one where our camp was located. The country is quite well settled to within a couple of miles of the lakes, there being a number of good farms. The lakes themselves are in a heavily wooded, rocky, mountainous region.

Birds Seen:

7. LOON.—A pair on each lake visited.

51. HERRING GULL.—4. A trapper told me that a few nest every year.

300. CANADA RUFFED GROUSE.—Very plentiful.

364. OSPREY.—2. On an island in one of the lakes was a nest on top of a pine stub about 35 feet in height. I was told a pair of Ospreys had nested there for a good many years.

388. BLACK-BILLED CUCKOO.—2.

390. BELTED KINGFISHER.—At all lakes visited.

393. HAIRY WOODPECKER.—5.

394c. DOWNY WOODPECKER.—Plentiful; saw one flock of at least 20.

412a. NORTHERN FLICKER.—Several.

420. NIGHTHAWK.—7.

423. CHIMNEY SWIFT.—3.

428. RUBY-THROATED HUMMINGBIRD.—Several around camp every day.

456. PHOEBE.—2.

461. WOOD PEWEE.—3.

463. YELLOW-BELLIED FLYCATCHER.—2.

467. LEAST FLYCATCHER.—2.

477. BLUE JAY.—These birds were flocking. I saw numerous flocks, of which the largest contained from 35 to 40 individuals.

514. EVENING GROSBEAK.—1 male. Dr. Christofferson, my associate in bird work, and myself have located the Evening Grosbeak west of Sault Ste. Marie, Michigan, in summer for three years. For the past seven winters I have had a flock of from 30 to 60 at my feeding station in Sault Ste. Marie, Michigan. They usually come in the latter part of October or the first part of November and stay until the latter part of May.

540. VESPER SPARROW.—Plentiful.

558. WHITE-THROATED SPARROW.—Abundant, old and young.

567. SLATE-COLORED JUNCO.—A pair of adults, with three young.

581. SONG SPARROW.—Plentiful.

583. LINCOLN'S SPARROW.—A pair of adults, with two young.

608. SCARLET TANAGER.—A pair of old birds with two young. This is just about the northern limit of the breeding area of this species in the Great Lakes region.

614. TREE SWALLOW.—3.

619. CEDAR WAXWING.—Common.

624. RED-EYED VIREO.—Common.

629. BLUE-HEADED VIREO.—1.

654. BLACK-THROATED BLUE WARBLER.—1 male.

655. MYRTLE WARBLER.—Two flocks, about 15 each.

657. MAGNOLIA WARBLER.—1.

667. BLACK-THROATED GREEN WARBLER.—5.

687. RRDSTART.—2.

722. WINTER WREN.—2.

735. BLACK-CAPPED CHICKADEE.—Several small flocks.

759b. HERMIT THRUSH.—2. On August 5 I found a nest with four eggs.

761. ROBIN.—A few.

766. BLUEBIRD.—About 25.

Both the Spring and Fall migrations of Warblers were very light. With the exception of the Myrtle Warbler we have seen no flocks of Warblers this year of over 10 or 12 birds.

Last year there was no food for the Winter birds in this vicinity or farther north, so, except at my feeding station, we had practically no Winter birds.

The Doctor and I spent four days in February up the Algoma Central Railway, some fifty miles north of the "Soo". Three Chickadees, one Downy Woodpecker, and one Canada Ruffed Grouse were the sum total of what we could find.

This year everything is loaded with fruit and the Winter birds should be here in force.

PROSECUTIONS—MIGRATORY BIRDS CONVENTION ACT

By Officers of the Dominion Parks Branch and Royal Canadian Mounted Police.

Reported during the period May 4th, 1922—November 23, 1922.

Joseph Bruno, Ojibway, Essex County, Ontario. Molesting Ducks in close season. Fine $10.00 and costs.

Seizure—one .35 Caliber Revolver.

Fred Chappus, Petite Cote, Ontario. Molesting Ducks in close season. Fine $10.00 and costs.

Seizure—One 12-gauge Winchester repeating shot gun.

Onesime Belisle, Ile Verte, P.Q. Having in possession an Eider Duck in close season. Fine $10.00 and costs.

Seizure—One shot gun.

William Belisle, Trois-Pistoles, P.Q. Having in possession an Eider Duck in close season. Charge withdrawn.

Wilfrid Talbot, Ste. Eloi, P.Q. Having in possession an Eider Duck in close season. Charge withdrawn.

Louis Mailloux, St. Simeon, P.Q. Having in possession portions of migratory birds in close season. Charge withdrawn.

John Tremblay, St. Simeon, P.Q. Having in possession portions of migratory birds in close season. Charge withdrawn.

John Lyman Nickerson, Big Mud Island, Yarmouth Co., N.S. Having in possession a number of Terns' eggs. Fine $15.00 and costs.

Frank Stranahan, Killam, Alberta. Hunting migratory game birds with an automatic shot gun. Fine $10.00 and costs.

Seizure—One automatic shot gun.

George Finlay, 21 Fairleigh Crescent, Hamilton, Ontario. Having in possession a Woodcock in close season. Fine $10.00.

W. W. Powell, 191 Mary St., Hamilton, Ontario. Having in possession a Woodcock in close season. Fine $10.00.

EDITORIAL

BIRD SANCTUARIES ON THE NORTH SHORE OF THE GULF OF ST. LAWRENCE.

CONSERVATION is now widely recognized as an essential element in our attitude toward all wild creatures. What treasures of wild life we now possess ought to have their perpetuation assured. In the maintenance of such a policy lies the greatest wealth and the greater good, both for us and for the humanity of the future.

In the conservation of our valuable and interesting bird life, it has been found that the establishment of sanctuaries or reserves, where birds may nest or feed in assured safety, is a most effective means of protection. It is especially applicable to sea-birds and other water-fowl, because these birds often nest habitually in concentrated colonies, where great numbers of breeding birds may be protected on comparatively small areas.

Many sanctuaries for such birds have already been established officially in North America. Up to the present time, however, far the greater number of these sanctuaries are in the territory of the United States. That country has established bird reservations on both the Atlantic and the Pacific coasts, in the Mississippi Valley, and in Alaska. Some of these include large areas.

Canada has a number of bird sanctuaries in the prairie regions of the West, but on the eastern coast of the Dominion there are but two such reserves—the Bird Rocks, and Percé Rock and the cliffs of Bonaventure Island. These two reserves, which are set aside by both the Province of Quebec and the Dominion Government, afford protection to large numbers of nesting sea-birds, especially to the picturesque Gannets, and are of much importance. Although they have been established but a few years, and have been comparatively little advertised, their potential value as attractions to tourists and summer holiday-makers may be realized to some extent from the fact that, in the summer of 1922, 767 visitors registered at Percé's two hotels and spent about $16,000.00 in the village.

But some of the water-fowl most in need of protection on our Atlantic seaboard receive little or no aid from these two reservations, and it is highly desirable that additional sanctuaries should be established in order to assure well-protected nesting areas for such species. One of the most important of these birds is the American Eider Duck, which is a close relative of the Eider of Europe, long famous for the valuable eider-down which it produces. In Norway and in Iceland the Eider is jealously protected because of the large revenue derived from the sale of its down, which is collected from the nest. This revenue is obtained by comparatively light labor, without interference with fishing or other occupations, and it is of great importance to the welfare of the inhabitants of the regions where down is obtained. There appears to be no good reason why the Eider of our Canadian coast should not add similarly to the revenue of our people if it received proper protection and if the down from its nests were gathered, cleaned, and sold. Far from receiving such protection in the Gulf of St. Lawrence area, however, the Eider has been mercilessly hunted and its eggs have been taken at every opportunity for decades, so that it was greatly reduced in numbers. The same is true of many of its neighbors among the sea-birds. Fortunately, Provincial and Federal game laws now afford some relief from this persecution.

The chief breeding-place of the American Eider in the Gulf of St. Lawrence region is along the north shore of the Gulf. Here are thousands of barren, rocky, uninhabited islands, of all shapes and sizes, which are at present economically useless. On these islands Eiders breed in moderate abundance, in company at times with several other species of protected sea-birds, such as Razor-billed Auks, Common Murres, Puffins, Gulls, and Terns. Here is an excellent, an unusual opportunity for the establishment of a series of sanctuaries which will be of great practical value, in that they will cause a few desolate islands, now of no use to any one, to become centers of valuable bird-life, yielding a revenue which will be a priceless boon to the poor inhabitants of the region, and which will doubtless have a marked influence in upbuilding this out-of-the-way part of the Dominion of Canada and the Province of Quebec. There is no doubt, in view of experience in European waters, that the Eider would quickly respond to the special protection which the sacntuaries would afford and would nest on the sanctuary islands in great numbers. Once the eider-down industry had become established in the sanctuaries, under government supervision, it is to be expected that the residents of the coast would voluntarily protect other islands, in order that the industry and the benefits to be derived from it might be increased.

The plan to establish sanctuaries for the protection of the birds of this coast is far from new. Lt.-Colonel William Wood, F.R.S.C., of Quebec, has repeatedly urged in print* the advisability of setting aside areas for the protection of the wonderful wild life of this region, although he advocated chiefly a large reservation in which all forms of valuable wild life would be protected. While such a reservation would be very desirable, it is felt that, as far as protection of the birds is concerned, a series of reservations of comparatively small size is preferable to one large reservation. The small reservations would be less expensive and less difficult to guard effectively, they would interfere less with the normal activities of the people resident in any area, and yet would extend their benefits more widely. Lt.-Colonel Wood obtained approval of his plan for Labrador Sanctuaries from many persons of note, including Dr. Robert Bell, the Right Hon. James Bryce, Dr. John M. Clarke, Napoleon A. Comeau, George Bird Grinnell, the Hon. Theodore Roosevelt, Ernest Thompson Seton, Alfred Russell Wallace, Sir Robert Baden-Powell, Rudyard Kipling, J. M. Macoun, and his Royal Highness the Duke of Connaught. Dr. Charles W. Townsend, who has often visited the north shore of the Gulf of St. Lawrence, has also published§ a paper entitled *Bird Conservation in Labrador*, in which he states that he believes "that the whole problem can be solved most rationally and

* "*Animal Sanctuaries in Labrador*," by Lt.-Colonel William Wood, F.R.S.C., Ottawa, 1911.
Supplement to Animal Sanctuaries in Labrador, by Lt.-Colonel William Wood, F.R.S.C., Ottawa, 1912.
Draft of a Plan for Beginning Animal Sanctuaries in Labrador, by Lt.-Colonel William Wood, 1913 (?).

§ *Bird Conservation in Labrador*, by Charles Wendell Townsend, M.D., Seventh Ann. Rep. Commission of Conservation, Ottawa, 1916.

satisfactorily for all concerned by the immediate establishment of *bird reservations* and goes on to advocate the setting aside of a series of small reservations among the archipelagoes fringing the north shore. The residents of that coast themselves are well known to realize the urgent need of giving protection to the birds which mean so much to them. Almost to a man they believe that a series of government bird sanctuaries should be established in their midst. The creation of such sanctuaries would meet with wide-spread popular approval and the task of patrolling them would thereby be rendered comparatively easy.

The time for the establishment of these sanctuaries is at hand. Both the Government of the Province of Quebec and the Dominion Government are fully informed concerning the question and have the necessary powers, and the creation on this coast by joint action on their part of a series of well-chosen reservations for birds, similar to those now under joint protection at Percé and the Bird Rocks, would be most welcome to all concerned. There is much to gain and nothing to lose by such action.

NOTES AND OBSERVATIONS

A FRESHWATER-ISOPOD NEW TO CANADA.—Since my article about these invertebrates was published in *The Canadian Field-Naturalist* for November, 1920, I have received from Prof. C. H. O'Donoghue of the University of Manitoba, Winnipeg, half a dozen specimens of Isopods "collected in a small stream, about half a mile northwest of the Biological Station at Departure Bay (Nanaimo), B.C., late in July and in August, 1921. The locality is right on the border of an old clearing that goes by the name of Hodgson's Ranch."

The specimens, when received, were dried up in the vial, but as this is the first record of freshwater isopods from western Canada, it was of importance to get them identified. I could see that it was an *Asellus*-species, but as it was little likely (see p. 148 in my article quoted above), that the central and eastern form, *A. communis* Say occurred on Vancouver Island, and as I am not familiar with the Isopods found in the far western part of United States, the specimens were sent to the U.S. National Museum, Washington, D.C., for identification. Mr. C. R. Shoemaker there has kindly identified them as *Asellus tomalensis* Harford, a species hitherto known only from the three Pacific States.

The type was described by S. J. Holmes on pp. 321-23, pl. 37, in *Proceed. California Academy of Sciences*, 3rd Series, III, 1904, from a single specimen, collected at Tomales Bay, California. Eight more specimens, collected by the Harriman Alaska Expedition at Lake Washington, near Seattle, are referred by H. Richardson to this species and described on pp. 431-33, figs. 487-89, of her Monograph Isopods N.A. (*Bull.* 54, U.S.N.M., Washington, 1905). Specimens were also collected in Tanner Creek, Portland, Oregon, in May, 1905, by Dr. J. E. Benedict.

The characteristics of the species are a light-brown, somewhat mottled colour, and a narrow, elongate body. The first pair of legs are subcheliform in shape, and their propodus (the joint next to the claw) is elliptical in outline, with the inferior margin straight, and furnished with numerous short spines or stiff hairs, by which latter characters it can be distinguished from *A. communis*.

The finding of additional freshwater-isopods in western Canada would have considerable interest, and be much appreciated by the undersigned.—FRITS JOHANSEN.

A CLADOCERAN NEW TO AMERICA.—On June 21st, 1922, in a collection of Entomostraca from a marshy pool near the Biological Station, St. Andrews, N.B., I found a specimen of *Scapholeberis cornuta*, Schoedler. I placed this specimen in culture and it produced two parthogenetic young which I raised to maturity. This species has been known for a long time in Europe, but this is, as far as I know, the first record of its occurrence in America.—A. BROOKER KLUGH.

BUMBLE-BEES ON BLEEDING HEART.—When I lived in Pilot Mound (1901-16) I grew *Dielytra spectabilis* for many years and can verify Mr. C. E. Johnson's observations.(*Can. Field-Nat.*, Vol. XXXVI, No. 3, March, 1922). The lovely pink of this flower's quaint globes immediately lost tone and faded as the result of the bumble-bee's perforating jaws.—H. M. SPEECHLY.

A FRESHWATER-SPONGE NAMED AFTER PROF. JOHN MACOUN.—In the list of new species of plants and animals named in honour of the late Prof. John Macoun, of Ottawa, appearing in the obituary in *The Canadian Field-Naturalist* for September, 1920, p. 113, and at the end of his autobiography (1922) p. 304, it is stated that the list is as yet imcomplete.

I therefore take the liberty to call attention to

the ommission of the unique freshwater-sponge collected by Prof. Macoun in the lake-pond situated in the centre of Sable Island, N.S., and described by Dr. A. H. MacKay, of Halifax, as *Heteromeyenia macouni* n. sp., in *Trans. N.S. Inst. Scien.*, Vol. X, 1899-1900.

Apart from the fact that it commemorates Prof. Macoun's important stay upon the island during the summer of 1899, and increases the list of animals named after him from five to six, I think that the record is also of importance as showing his interest in freshwater life as well as in that upon land and in the sea.—FRITS JOHANSEN.

ACUTENESS OF VISION IN *Pagurus arcadianus*.—The compound eye of Arthropods is extremely well adapted to perceive movement but not so well adapted for accurate perception of form. It has been shown experimentally that ants of the genus *Formica* can see large stationary objects at a distance of 10 centimeters, but cannot see small objects, that is, objects of their own size, further than 5 millimeters. Dragonflies, which, as far as known, have the most acute vision of all Arthropods, appear to be able to perceive the form of objects at 2 meters. It is not always easy, in fact it is often extremely difficult, to say what sense is involved in bringing about a certain action in an insect or a crustacean. Many reactions of these animals which are casually put down as being due to sight are found on experiment to be due to some other sense, and any exact data on this matter are of interest from the standpoint of animal psychology.

At the Atlantic Biological Station in August, 1921, we took six Hermit Crabs, *Pagurus arcadianus*, out of the shells of the Whelk, *Buccinum undatum*, which they had inhabited, and placed the crabs in one of the large shallow tanks of running sea water in the laboratory. We then placed clean, sun-dried Whelk shells at various distances from the Hermits. Up to a distance of 80 centimeters the crabs perceived the shells at once, made straight for them, "measured them up", outside and inside, with their chelae, and, if they found them suitable, promptly inserted their bodies into the shells. In this case, there is no doubt that vision was the sense involved, since the clean shells could not give off any substance which could be perceived by the chemotactic senses.—A. BROOKER KLUGH.

Cassiope tetragona IN WESTERN ALBERTA.—While collecting in the Rocky Mountains of Western Alberta in September, 1922, I was fortunate in discovering a plant whose occurrence at this point may prove interesting to many botanists. I refer to the white or moss heather (*Cassiope tetragona*). The locality was Rocky Pass just south of Mountian Park. with an altitude of about 7,000 feet. The specimen collected was in a mossy spruce woods near timber-line. It is evidently a far northern plant, for Dr. M. O. Malte, Chief Botanist of the National Herbarium, who very kindly identified this and all other botanical specimens for me, has this to say of it: "Concerning No. 673, I am glad to state that you have brought the southern limit of this northern plant a long way south. We have *Cassiope tetragona* in our herbarium from numerous places in the far north, the most southern locality, however, being from the Yukon district."—J. DEWEY SOPER.

BOOK REVIEW

THE CONSERVATION OF THE WILD LIFE OF CANADA.—(*Concluded from Vol. XXXVI, No. 7, p. 140*).

While game laws with longer close seasons and more restricted bag limits have done something to prevent the rapid if not appalling diminution of all kinds of game from the lordly moose to the diminutive Plover and Sandpiper, the total result in comparison with the annually increasing number of gunners and the improvement of weapons of destruction is not encouraging. Of recent years the sentiment seems to be growing among conservationists that the only hope of preserving a remnant of many species is by establishing here and there a nucleus in the shape of a park or sanctuary where destruction shall be absolutely prohibited. Recognizing the legitimate needs of sportsmen, these oases of protection, which may also serve as forest reserves or recreation parks, may preserve species which would otherwise become absolutely extinct, and the overflow from the boundaries afford a perennial and certain supply to surrounding territory. The United States have done much along such lines, but Canada, a newer country with more unoccupied land, has as Dr. Hornaday says, "set out to get for herself a-plenty of national parks and game preserves while the getting was good. No province seemed disposed to be left behind in this conservation enterprise. As a final result, these red-spotted maps tell a great story of enlighten-

ment and progress. Until it enters its decadence, no city, State, or nation ever deconsecrates and gives back to commercial uses a park or a wild life sanctuary that has once been dedicated to the whole people as theirs."

Eastern Canada has four huge game reserves, Manitoba and Saskatchewan have thirty-one, mostly small ones; Alberta and British Columbia have seven between them, including the immense areas of Jasper Park and the Rocky Mountains Park at Banff. Maps of these parks and wild life sanctuaries are given, together with accounts of their principal attractions, and anyone in Canada or outside of it who expects ever to spend a vacation in Canada should have the book as a companion.

The Buffalo Park at Wainwright, Alberta, is a most successful experiment. A few hundred buffalo purchased in Montana in 1908 have increased to more than five thousand and are now taxing the resources of the park. The whole story of the former abundance of the buffalo and its tragic extermination as a wild animal is graphically told, the future of the buffalo is discussed, as well as the results of cross-breeding with domestic cattle. An area southwest of Medicine Hat has been fenced to include a herd of wild antelope on their native range, and they are increasing, an encouraging sign, as antelope have never thrived when captured and confined. The extended chapter on the game animals of Canada, describing their distribution, habits, and present numbers, will be a delight to the general reader. Much illuminating knowledge is given in regard to the increase of the common deer after the settlement of the country, and the book also sums up the tangible part of the mass of floating data regarding the numbers and possibility of utilization of the barren ground caribou and gives a fair presentation of the present knowledge of the reindeer industry in Alaska and its applicability to Canada. The rapid shrinkage in the numbers of the muskox is lamented and Dr. Hewitt's share in securing a permanent closed season for this interesting and valuable animal is discussed, as well as the latest proposals for the potential utilization of the muskox in a domesticated state.

Under the heading of game birds and larger non-game birds of Canada, particular attention is given to those birds which have been recently so reduced in numbers as to receive special protection under the Migratory Birds Convention while the other more important game birds are fully discussed. An excellent chapter is devoted to birds in relation to agriculture. Under this are most useful descriptions of methods of attracting birds, lists of native trees and shrubs bearing fruits attractive to birds, methods of building bird-houses, destruction of bird enemies, and an account of the subject of bird sanctuaries. In another chapter the enemies of wild life are given detailed attention, the most important feature in this line being the wolf and coyote problem as affecting big game and the livestock interests.

Taken as a whole the book may be said to contain something of interest to every person who is interested in any phase of wild life and there are few who can not qualify in that class. The year since the above was written has conclusively demonstrated to the writer its great value as a reference book and any Canadian library, public or private, is incomplete without it. The scientist, naturalist, and teacher find in Dr. Hewitt's book facts not assembled elsewhere, and made clear by maps and charts; the conservationist and law-maker find arguments for justifying their claims, and all Canadians may take pride in reading that their country has done so creditably in the world-wide movement for conservation, and feel gratitude to Dr. Hewitt, the lamented friend of man who did so much for the cause of conservation and so gracefully and graphically recorded it.—R. M. A.

CONTRIBUTIONS TO CANADIAN BIOLOGY, 1906-20
(*Supplement to Annual Reports of the Departments of Marine and Fisheries and Naval Service, Ottawa, 1912-21.*)

The first two (1901-1902-05) numbers or volumes of this important Government publication dealing with marine and freshwater biology have been reviewed in the *Ottawa Naturalist* for May, 1902, and October, 1907, where also the history and organization of the Biological Station at St. Andrews, N.B., is recorded.

Since then, and until the changing of the editorial office from Ottawa (Prof. Prince), to Toronto (Prof. McMurrich), in 1921, six volumes (1906-10, 1911-4, 1914-5, 1915-6, 1917, 1918-20) have appeared, still further increasing the scientific value of these reports, and showing the great variety of subjects studied by the contributors. In addition to the Atlantic Station, two more biological stations were established, one at Departure Bay (Nanaimo), B.C., and the other at Georgian Bay, Ont. The latter was, however, discontinued after some years, as similar work is being done by institutions in Toronto, and the collections made deposited in the Government museums. The Biological Board of Canada has however up to this day, continued the investigations of fishery-problems in the Great Lakes and published the results thereof.

Apart from the many treatises on Algæ and

Diatoms, botanists will find several, original articles on plants. Thus the 1906-10 volume includes a paper on the flora of the St. Croix River-valley and Passamaquoddy Bay region, N.B.,* discussed from an ecological point of view; and the 1911-14 volume (Fasc. II) three papers on the plants of Georgian Bay.

Geologists will be particularly interested in two articles about the geological environments of the Biological Stations at Departure Bay, B.C., and St. Andrews, N.B., in the 1906-10 and 1915-16 volumes respectively. And entomologists will appreciate the three papers on Odonata and Ephemeroidea (both adults and immature stages) in the 1911-14 (Fasc. II) volume.

The vast majority of articles in these six volumes treat however of course hydrography (in its widest sense), marine biology and fishery-problems. To give an idea of the great variety of subjects we will first take those dealing with physiology, chemistry and bacteriology.

Experiments with freezing and thawing of live fishes are recorded in the 1911-14 volume; while examinations of the content of iodine, etc., in marine animals and algæ are also found in the 1914-15 volume. The 1917 and 1918-20 volumes contain half a dozen treatises on the putrefaction, bacteriology, etc., of fresh and canned fish, questions as important for the consumer as for the packer.

In the line of hydrography, five articles on the temperatures, salinity, etc., of the water in the Bay of Fundy and Passamaquoddy Bay will be found in the 1906-10, 1914-15 and 1917 volumes; while the waters at Departure Bay, B.C., are treated in the 1914-15 and the 1918-20 volumes. It is a well known fact, that no real understanding of the movements of the fishes, their breeding-habits, etc., is possible without an examination of the surroundings in which they live; quite apart from the importance of hydrographic investigations for meteorology, sailing, etc.

As for the microscopic life (Plankton) floating in the sea and in fresh-water, the most primitive forms (Phyto-plankton) occurring in the Bay of Fundy are recorded and discussed (distribution, cultures, etc.), in the 1906-10, 1911-14, 1915-16 and 1918-20 volumes; the last named volume also contains an article about the Diatoms from other Canadian localities, viz.: the Magdalen Islands, Montreal, Georgian Bay, and Lake Winnipeg. The Zoo-plankton forms occurring at St. Andrews, N.B., are discussed in the 1911-14 and 1915-16 volumes ;and the 1906-10 volume contains an account of the different bivalve Mollusc-larvæ at the Atlantic coast of Canada. Also the distributions of a peculiar family of pelagic worms, and of floating Tunicates, at the Atlantic coast, as shown by the collections made by the Canadian Fisheries Expedition, 1914-15, are described in the 1918-20 volume.

The importance of the study of plankton-forms need hardly be emphasized; the more minute and primitive forms serve as food for the larger ones; and practically all the marine animals, from the fishes down to the lower invertebrates, have a pelagic stage of shorter or longer duration, during which they contribute to the make-up of the plankton. Besides the plankton forms the food for some of the largest whales and sharks, and for certain fishes, such as the herring, etc., of enormous economic importance.

As to the bottom-life, the economic value of the kelp-beds of the British Columbia coast is discussed in the 1914-15 volume; while marine algæ from Passamaquoddy Bay, N.B., are recorded and described in the 1915-16 and 1918-20 volumes. Accounts of the marine invertebrate fauna in general will be found in the 1906-10 and 1917 volumes, so far as the Atlantic coast is concerned, and in the 1918-20 vollme for Departure Bay, B.C.

Coming to the diffeernt groups of invertebrates, observations on the Actinaria (sea-anemones) occurring at St. Andrews, N.B., are found in the 1906-10 volume; while the 1917 and 1918-20 volumes contain two papers (the one an illustrated semipopular key) on the Hydroids of eastern Canada.

The freshwater-leeches and polyzoa (Bryozoa) occurring in Georgian Bay, Ont., are recorded in the 1911-14 volume (Fasc. II).

The 1911-14 volume also contains an account of the freshwater-molluscs of Georgian Bay, Ont., while the pearly freshwater-mussels of Ontario are discussed in the 1917 volume as to their economic value.

A list of the marine molluscs found at St. Andrews, N.B., will be found in the 1911-14 volume (Fasc. I) and the 1917 volume contains an interesting account of the ship-worm (*Teredo navalis*), so destructive an animal to the wharves, etc. Five papers dealing with oysters and clams in tc Maritime Provinces (Gulf of St. Lawrence) will be found in the 1906-10, 1914-15, and 1915-16 volumes, treating of their economic importance, proper surroundings, diseases, etc.

Turning to Crustacea we will find two important contributions to our knowledge of the freshwater forms of Ontario in the 1911-14 volume; two other papers on the marine forms occurring at St. Andrews, N.B., in the 1906-10 and 1911-14 volumes; and a fifth on the marine Decapods at the coasts of British Columbia in the 1906-10 volume. The most valuable of all our curstaceans, the lobster, of course also comes in for attention; and six articles on its physiology, histology, diseases, surroundings, etc., will be found in the 1906-10, 1914-15, 1917, and 1918-20 volumes. The fragility of the very young lobsters, and their susceptibility to less perfect surroundings add to the importance of these papers.

As to the simple looking, but highly organized Tunicates (sea-squirts), a detailed description, accompanied by twelve beautiful plates, of Ascidiacea collected in British Columbia and at Herschel Island, Arctic Canada, recording a number of new species, will be found in the 1906-10 volume.

The different parasites affecting fishes are of course also treated. Thus, of curstaceans, copepods from Vancouver IslTnR Tr? describeR in zhe 1906-10 volume, and from zhe Bay of Fundy in the 1911-14 volume. An interesting tap?-worm (*Cestod*) from Black Bass is described in the 1911-14 volume; while the primitive parasites (*Sporozoa*) affecting fishes at the Atlantic coast are recorded in the same volume (Fasc. I), and in that for 1914-15.

Results of an investigation into the different kinds of bait used by fihsermen at the Atlantic coast will be found in the 1906-10 volumes; while the 1917 volume contains a long, illustrated report on the investigations of the herds of sealions frequenting the Pacific coast of Canada, a rather controversial subject, as the fishermen claim that much damage to the fisheries (particularly to the salmon) is done by these seals.

Fishes and fisheries in a stricter sense are of course treated in a number of articles and reports.

Thus the 1911-14 volume contains a long account of the freshwater fishes of Georgian Bay, Ont., illustrated by plates; while the freshwater and marine fishes* of Prince Edward Island are recorded in the 1906-10 volume. In the 1917 volume an annotated list of the fishes ofund in the vicinity of Magdalen Islands and the Nova Scotia coast opposite will be found.

Treatises dealing with the appearance, life-history, and economic value of certain fishes are well represented. Thus, besides a description of a new Cottoid (sculpin) from Departure Bay, B.C., in the 1916-10 volume, the Pacific Halibut-fisheries are traeted in the 1914-15 volume; and the biology, etc., of the various kinds (Spring-, Coho-, Sockeye-, Dog-, Humpback-) of Salmon occurring in British Columbia will be found ni four articles in the 1915-16, 1917, 1918-20 volumes. Of fishes occurring at the Atlantic coast of Canada, the utilization of the Selachians (dog-fish, etct.)is discussed in the 1917 volume; the aggs and larvæ of Halibut in the 1914-15 volume; and the life-history (as learned from scale examinations) of the Cod, Hake, and Haddock, and the migration of Eels also in the 1914-15 volume. The 1915-16 volume contains an article about the colour-pattern of cod-fishes; the 1917 volume another about the growth of the Pollock; and the biology of the Mutton-fish (*Zoarces anguillaris*) is gtreated in the 1918-20 volume.

To enumerate the names of the different authors is hardly necessary; they are practically all Canadian workers, and their writings mostly embody the results of their own investigations at the two (three) Biological Stations; often they are authorities upon the particular subject they write ablut. After the acquisition of the large motor-launch, *Prince*, specially constructe and fitted out for marine investigations, it has been possible to utilize it for research work far away from the St. Andrews station, where the main body of workers stay during the summer and have smaller boats at their disposal. Thus the work goes on, during the summer, both in the Gulf of St. Lawrence, along the outer coast of Nova Scotia, and in the Bay of Fundy; and now everything is running smoothly. Each ot the two stations is in charge of an efficient curator of scientific standing and is well patronized by workers from all over Canada. It is well to remember the great and successful work accomplished by the former chairman and present secretary-treasurer of the Biological Board of Canada, Prof. E. E. Prince, Dominion Commissioner of Fisheries, who has the main credit ofr the creation and proper functioning of this institution.

As chairman of the Board he arranged for the upkeep of the biological stations and the selecting of the workers, and also for the planning and carrying out of the investigations; as individual worker in research studies at the stations he showed the way and inspired his colleagues; finally in the onerous work of gathering in and editing his reports resulting from the investigations he was tireless in his endeavour to make the volumes published worthy of Canadian Science. The important work of making outsiders appreciate the work being done by the Board for the benefit of one of the principal resources and industries of Canada has also largely devolved upon him.

It is perhaps worth mentioning that the Biological Board of Canada, the establishment of which, in 1898, has been recorded in the *Ottawa Naturalis* for May, 1902, p. 46, is made up of a dozen representatives from the principal universities in Canada; and though in the course of time certain of its members have been replaced by others the charactre and purpose of the Board is the same as formerly. Marine Biology, Anatomy, Physiology, Botany, Geology and Chemistry are all ably represented upon the Board; and though its members serve without pay, and only meet occasionally, it is decidedly one of the most useful and successful institutions established by the Canadian Government during the last thirty years.

If it is true that the value of a particular Department is not measured by the number of people employed in it, nor by the *amount* of printed matter emanating from it; but by economic and efficient administration, and by the courageous and intelligent tackling of great practical and scientific problems, resulting in important contributions to our knowlecge of the resources of the country, then the Biological Board of Canada occupies a place in the front rank. Similar institutions in the United States are supported by private means, and the same is mainly the case with the biological stations in Europe. In other countries instruction of university-students is an important part of the work; in Canada however the effort is devoted solely to original research by post-graduates, and thus the result is more immediate.

Is it too much to hope that the various provinces of Canada, who are so insistent upon the resources within their borders, to a far greater extent than hitherto will recognize their responsibilities as to the scientific investigation and development of them? Investigations of the many important bodies of fresh water in southern Canada could at least be done by the provinces at reasonable expense, as shown by the Universities of Toronto and Manitoba, leaving the Great Lakes and the sea (where international cooperation is often necessary), and the arctic territories to the Dominion Government.—F. J.

*In the table of contents the title of this paper is given as *Notes on the Fauna (should be Fishes) of Tignish, P.E.I.*

The Topley Company

PHOTOGRAPHIC MATERIAL.
SCIENTIFIC APPARATUS.

132 Sparks St. OTTAWA.

Grant-Holden-Graham-Limited

Manufacturers of
HIGH GRADE TENTS, TARPAULINS AND SLEEPING BAGS
OUTFITTERS TO SURVEYORS AND ENGINEERS.

Write for Catalogues.

147 Albert Street OTTAWA, Canada

C. A. OLMSTED & SON

JEWELLERS, OPTICIANS, WATCHMAKERS AND ENGRAVERS.

Dealers in Fine Diamonds, Sterling Silver,
Electro-Plated Ware and Rich Cut Glass.

"The Store of MODERATE PRICES."

208 Sparks St., OTTAWA. Phone Queen 1430

Lyman's Limited

(Established 1800)

Manufacturing Chemists

Importers and Dealers in
CHEMICAL AND ASSAY APPARATUS

344 St. Paul St., West, MONTREAL



Grow Good Crops——Seeds——Plants——Bulbs.

Our rigorous system of testing eliminates loss and disappointment from your garden.

KENNETH McDONALD & SONS, Limited

Seed and Bulb Merchants. Market Square, OTTAWA.

L. C. Smith & Bros. Typewriter

BUILT LIKE A WATCH. MOST POPULAR TYPEWRITER TO-DAY

OTTAWA TYPEWRITER CO., Limited.

THE ONTARIO HUGHES OWENS CO., Limited

SCIENTIFIC APPARATUS AND DRAWING MATERIALS.

We have a Modern Repair Department.

529 Sussex Street, Ottawa. Phone Q. 8028

THE BANK OF NOVA SCOTIA

CAPITAL	$ 9,700,000.
RESERVE FUND AND DIVIDEND PROFITS OVER	18,000,000.
TOTAL ASSETS OVER	230,000,000.

SEVENTEEN BRANCHES IN OTTAWA AND HULL.

WARD'S NAT. SCIENCE ESTABLISHMENT.

HEADQUARTERS FOR ENTOMOLOGICAL SUPPLIES AND SPECIMENS

Rochester, N.Y., U.S.A.

Manufacturers of the genuine Schmitt boxes, exhibition cases and cabinets, also of the American Entomological Company's insect pins.

Riker Mounts and botanical mounts always on hand, also Riker botanical presses.

Send for our supply catalogue and other lists of interest to collectors.

The Toronto General Trusts Corporation

CAPITAL, $1,500,000. RESERVE, $2,000,000

Successful administration of ESTATES ranging in value from $500 to $5,000.00 each, is the best guarantee that you may confidently name as your EXECUTOR and TRUSTEE this Corporation.

JAMES DAVEY, *Manager.* *Ottawa Branch:* COR. SPARKS and ELGIN STS.

The Mortimer Co. Limited

PRODUCERS OF THOUGHTFUL PRINTING.

Lithographers, Engravers, Bookbinders, Creators of Advertising Literature.

OTTAWA, MONTREAL TORONTO

The Ottawa Monotype Composition Co.

COMPOSITION—MAKE UP—TYPE FOR CASES

Makers of "CAPITAL TYPE"

TELEPHONE QUEEN 6704 171-175 NEPEAN STREET

Henry Birks & Sons Limited

GOLD AND SILVERSMITHS

101-105 Sparks Street,

OTTAWA

SUBSCRIPTION BLANK

The Membership Committee of the Ottawa Field-Naturalists' Club is making a special effort to increase the subscription list of THE CANADIAN FIELD-NATURALIST. Every member of the Club is urged to assist in this campaign by showingthis number to a possible subscriber and endeavoring to have the attached blank filled in and forwarded to the Treasurer.

MR. C. B. HUTCHINGS, *Treasurer*, O.F.-N.C.

Entomological Branch, Dept. of Agriculture, Ottawa, Ont.

I enclose herewith One Dollar and Fifty Cents subscription to THE CANADIAN FIELD-NATURALIST for one year.

.....

.....

.....

W. A. Rankin
410-412 Bank St., Ottawa.
PHONES—QUEEN 1023-1024.

Fine Builders' Hardware
Refrigerators and Hammocks.

Inspected Milk
Ice Cream

"Ottawa Dairy"

Fresh Butter
Buttermilk.

JAMES HOPE & SONS
Booksellers, Stationers,
Bookbinders, Printers.
63 SPARKS STREET OTTAWA.

GEO. E. PRESTON & SONS
MERCHANT TAILORS
We make everything we sell and guarantee everything we make.
217-219 RIDEAU ST., OTTAWA.

THE C. C. RAY Co. Limited
Best Quality. **COAL** Lowest Prices.
46 Sparks St., Ottawa Phone Q. 461

Dr. Mark G. McELHINNEY
Dentist to certain of
the cognoscenti.
252 LISGAR STREET, OTTAWA
Phone Queen 2438.

ALWAYS *at your* **SERVICE**
The Ottawa Gas Co.
The Ottawa Electric Co.

FOR SALE—Back Numbers of The Ottawa Naturalist.

The Club has for sale complete sets of its publications. Enquiries regarding price should be addressed to the Secretary of the Club, Mr. C. L. Patch, Geological Survey, Ottawa.

Any member having copies of the March, 1896, January, February, March and August, 1898, and December, 1900, issue of the Ottawa Naturalist, and who desires to dispose of the same, is requested to communicate with the Secretary.

The Canadian Field-Naturalist

VOL. XXXVI OTTAWA, ONT., DECEMBER, 1922 No. 9

THE BIRDS OF NORTH BAY, ONTARIO, AND VICINITY IN 1904

By Stuart L. Thompson

NORTH BAY is situated on the northeast shore of Lake Nipissing, in the District of Nipissing, Province of Ontario. At the time of my acquaintance with it, 1904, it was a town of some 3,500 inhabitants of French-Canadian and British stock, with a sprinkling of Indians, living for the most part in the outskirts, the territory to the west of the lake being an Indian reserve.

Speaking generally, the country surrounding the town slopes very gently towards the lake, is fairly level and extends north and east some four miles where it rises abruptly into a sort of bushy, rounded cliff between 100 and 200 feet high. This ridge extends in a south-east to westerly direction, forming a sharp contour on the sky line. In the south and east it rises abruptly, but it is gradually lost towards the west in the general level. Below this ridge is the flat sloping surface covered with low woods that form the immediate background to the town. North and east of the town the country is flat or gently rolling, with more or less stony mounds, and dips down into a damp, boggy thicket which becomes locally grassy muskeg. To the west the same character of country prevails except that the mounds become rocky hills, sometimes of bare rock with little vegetation of any size. Lake Nipissing, occupying the south and west outlook from the town, is 18 miles in length and empties into Georgian Bay by way of the French River. It is generally supposed to be a treacherous lake due to its shallowness and the sudden wind storms to which it is subject, which raise comparatively rough water. For many miles along the north arm of the lake the shore is a level sandy beach, but to the west it becomes rocky and wooded.

On the south side of the town flows Chippewa Creek, a small stream but a few feet across. Its course is very crooked and its banks for the most part are covered with alders and similar shrubbery. It rises to the north in the low-lying woods behind the town. A mile or so west of town is Chien Creek, a much larger stream, rising in the rocky hills and flowing through rock channels and small gorges. Like Chippewa Creek it empties into the lake.

Speaking generally the country about North Bay could at that time be called rocky woods. The only exception to this description was the low-lying grassy and bushy marsh. The only spot that could be called a field was a certain clearing of 40 or 50 acres in extent, grass grown between great pine stumps, bounded by the lake on one side and by dense woods and the town on the others. Here alone were seen such species as Vesper Sparrow and Meadowlark.

The forest was a mixture of coniferous and deciduous trees. The commoner of the former species were Red and White Pine, Cedar and Balsam Fir, with Tamarack in the damp parts. Of the latter, Black, Yellow and White Birch; Maple, Cherry, Poplar, Willow, Alder, Dogwood and other of lower growth were found. The character of the country on the whole is very suitable for both migrant and resident birds.

The climate does not differ greatly from that of Northern Ontario generally, and is not greatly modified either way by the immediate presence of Lake Nipissing. The summers are short and hot but the nights are always cool enough for comfort. June and July are the hottest months; August, especially towards the end, usually suggests the return of autumn. The winters are long and fairly cold. Heavy night frosts begin in October. November is cold and December usually sees winter fairly well begun. January and February are the coldest months. Temperatures of 40 and 45 degrees below zero are not rare and the snow lies about two feet deep. Towards the end of February the sun shines brightly and the days appear almost mild. In March, real winter may be considered to be past. April is a rather cold spring month and May is likely to be showery.

1. *Podilymbus podiceps*. Pied-Billed Grebe. —Common summer resident in the reedy parts at the west end of Lake Nipissing. August 29, I secured two specimens.

2 & 3. *Larus argentatus* and *L. delawarensis.* HERRING and RING-BILLED GULLS.—Both tolerably common summer residents on Lake Nipissing.

4. *Mergus serrator.* RED-BREASTED MERGANSER.—Very common around Manitou Island, Lake Nipissing, where in August we constantly saw adults with young. They rarely permitted close approach, pattering off over the water as we approached. The young, though unable to fly were well able to care for themselves. It was no rare thing to come upon a flock of ten or fifteen Mergansers as our canoe rounded a point. We secured one specimen which proved to be this species. The only adults seen were females, the males never appearing.

5. *Ardea herodias.* GREAT BLUE HERON.—Common summer resident. Frequently seen on the lake shore and occasionally flying overland. In August I found them very abundant in marshes and on rocky islets in the West Arm of Lake Nipissing.

6. *Marila* sp. SCAUP DUCK.—A Scaup Duck frequently seen on the lake in September. Whether Greater or Lesser Scaup could not be determined.

7. *Botaurus lentiginosus.* AMERICAN BITTERN.—Rather rare. Seen only on two occasions in low-lying open muskeg country. There is not sufficient open marsh to lead one to expect many Bitterns.

8. *Pisobia bairdi.* BAIRD'S SANDPIPER.—The only actual record I have of Baird's Sandpiper is that of a specimen collected September 7 on the shores of Lake Nipissing. This day I found shore birds quite common and saw several small flocks of Baird's. Although I have seen Sandpipers in spring that might be Baird's I have no certain spring record.

9. *Ereunetes pusillus.* SEMIPALMATED SANDPIPER.—Found commonly in the fall. A specimen collected September 7. I think I have seen it in spring but never certainly identified it then.

10. *Actitis macularia.* SPOTTED SANDPIPER.—Common summer resident both on the lake shore and on muddy flats of the creek.

11. *Oxyechus vociferus.* KILLDEER.—Owing to the lack of open fields that flood and remain muddy into late spring the Killdeer is rather rare in the North Bay country. Occasionally near the shore of the lake I have heard or seen it flying over. The only time I ever met the Killdeer at close range here was in June, 1903, when I came upon one amongst many Spotted Sandpipers on the beach near the mouth of a sewer.

12. *Circus hudsonius.* MARSH HAWK.—Common summer resident. It was often seen winging back and forth over the muskeg country or the rough open clearings. Many were in high plumage, being quite pearl gray. In fall it is seldom seen even in immature plumage.

13. *Accipiter velox.* SHARP-SHINNED HAWK.—Rather rare summer resident. I have seen the Sharp-shin only on rare occasions and in the more or less wooded regions where his small size and long, slim appearance helped to identify him.

14. *Buteo platypterus.* BROAD-WINGED HAWK.—Rather rarely seen. On several occasions I have seen Hawks that might have been Broad-winged but only when the familiar *"Chuck-kee-e-e-e"* was heard was I sure of the species.

15. *Haliæetus leucocephalus.* BALD EAGLE.—Rather rare. Saw one pair one day while walking to Powassin. Though they were flying over I could see the markings plainly. In August on French River I saw a fine specimen flying back and forth for some minutes over the marsh, when the white head and tail were quite easily seen.

16. *Falco sparverius.* AMERICAN SPARROW HAWK.—Common summer resident. This species is often seen sitting on a stump top or telegraph pole overlooking a stretch of rocky clearing below. It is more common in early fall. One specimen shot September 9th had in its stomach the remains of a small rodent. On several occasions I have found the Sparrow Hawk in tree tops in deep woods but generally it is a bird of the open c earings.

17. *Pandion haliaetus.* FISH HAWK.—The Osprey is quite common on Lake Nipissing. Several seen on a trip on the French River. A female was collected August 30th at the west end of Lake Nipissing.

18. *Ceryle alcyon.* BELTED KINGFISHER.—Common summer resident. Kingfishers are always to be seen on the lake shore or near Chippewa Creek. They were quite common on Manitou Island, some six miles from town in Lake Nipissing.

19. *Dryobates villosus.* HAIRY WOODPECKER.—Unlike the Downy, the Hairy is rather rare in summer, being found only occasionally, and being then solitary and silent. On the approach of fall it becomes common and is often seen flying over the brulé, uttering a sharp *"wick"* and sometimes following the note with a rolling call.

20. *Dryobates pubescens.* DOWNY WOODPECKER.—Very common summer resident. It may be seen in almost any wooded part of the country, often in twos and threes. Throughout the summer it is common and in early fall abundant—certainly the most numerous of the Woodpeckers here.

21. *Picoides arcticus.* ARCTIC THREE-TOED WOODPECKER.—The three-toed Woodpecker can not be considered a common bird in this region.

I occasionally met with it in winter, working away on tree trunks in silence except for the noise of its own chiselling. I never heard it utter a note. The only fall record I have is that of one seen September 22, 1904. One collected at Toronto, October 27, would give rise to the belief that the Woodpecker was working southward.

22. *Sphyrapicus varius.* YELLOW-BELLIED SAPSUCKER.—Fairly common in open deciduous woods in spring, but it becomes scarcer as the season advances. No fall records.

23. *Phloeotomus pileatus.* PILEATED WOODPECKER.—Rare summer resident. I have only one record of this large Woodpecker though it is distinctly at home here as evidenced on canoe trips in various parts of adjacent country from 1907 to 1922, when it has been frequently seen and more often heard.

24. *Melanerpes erythrocephalus.* RED-HEADED WOODPECKER.—Found quite frequently in the more open parts of the country. I never saw it in the deep woods with the Hairy and Downy Woodpeckers but always in clearings, where it finds upright stumps of trees, 10 to 30 feet high, for resting and nesting sites. Another common place for it was on the telegraph poles along the railway lines, which of course are "upright stumps" to them as much as those in the other clearings. It is usually silent except for its *cherr*, which it repeats from an elevated spot.

25. *Colaptes auratus.* FLICKER.—Rather rare summer resident. Although in a well-wooded country I did not find Flickers very abundant. I fancy they prefer more cultivated regions.

26. *Chordeiles virginianus.* NIGHTHAWK.—Abundant summer resident. This species is a common object in the evening sky from May until the end of August, where it spends most of its time in "booming". Occasionally through the day I flushed Nighthawks in the open woods, when they were nearly always silent. Several flights were seen in the late summer or early fall (September), when many passed overhead erratically in silence.

27. *Tyrannus tyrannus.* KINGBIRD.—Common resident from late April to September. Generally seen near town and in the more settled parts.

28. *Myiarchus crinitus.* CRESTED FLYCATCHER.—Rather rare summer resident. I found this flycatcher in a clump of tall trees known as "The Park" several times, uttering its usual note. I cannot recall having seen it elsewhere in the neighborhood or in the fall.

29. *Sayornis phoebe.* PHOEBE.—Tolerably common summer resident. While walking along the railroad track, the best road for any distance in the neighborhood, I have often observed it on the telegraph wires and have thought that it seemed as if it had learned that along the tracks it could find suitable culverts for nesting. Occasionally I have found the Phoebe some distance from any bridge or clearing, generally in some low-lying land, where it probably nests in the roots of upturned stumps.

30. *Nuttallornis borealis.* OLIVE-SIDED FLYCATCHER.—Tolerably common summer resident. This bird is more often heard than seen. His high clear whistle can readily be heard half a mile away. It is generally to be found on a dead tree-top or similar commanding position, noisily repeating a lusty "*qui-qui*" or which it frequently continues into the loud call of "*qui quee-queer*". Like the Chebec, the Olive-side ceases to sing or call as summer closes and about the end of August disappears from these northern haunts.

31. *Myiochanes virens.* WOOD PEWEE.—Tolerably common in the taller and more open woods. I never failed to find it in the grove by the lake front commonly known as "The Park". It was generally in full song and evidently nesting for it remained in the same vicinity throughout the entire season.

32. *Empidonax trailli.* TRAILL'S FLYCATCHER.—Common summer resident. This Flycatcher can always be found in the dense low bushes of the muskeg country. I found it abundant any time I walked any distance along the railway tracks. It is heard even more often than seen. Its note can be readily recalled by the words "*Right here*". I have never heard any other note nor pretense of flight song such as the Chebec sometimes utters. So characteristic of the flycatcher family is this bird's note that I recognized it as such before I first saw the bird. The scrubby country, thick with low bushes, that it inhabits also assists in its identification.

33. *Empidonax minimus.* LEAST FLYCATCHER.—Abundant summer resident. The Chebec may be seen at all times in his bushy haunts, constantly calling his snappy "*Chebec.*" On many occasions I have seen him execute a flight song after he had been *chebecing* for a long while. He springs into the air and utters a "*Too-oorle too-oorle*" several times, ending in his usual "*chebec,*" which identifies him at once. With the coming of summer the Least Flycatcher becomes silent and by early fall has slipped away from the northern woods.

34. *Otocoris alpestris.* HORNED LARK.—There is very little country about North Bay suitable for the Horned Lark. I saw it once in the rough clearings and twice met it in the large open field called "The Park", near the lake. Probably a pair nested there the season of 1904.

35. *Cyanocitta cristata*. BLUE JAY.—Throughout spring and summer the Blue Jays are fairly common, but for the most part silent. In September, when the first chilly days come, they become more or less abundant in small roving flocks in woods and clearing and are more noisy.

36. *Perisoreus canadensis*. CANADA JAY.—In my experience the Canada Jay is not a summer resident about North Bay. Although I spent much of the summer of 1903 and all of 1904 in this vicinity, it was not until late in September, 1904, that I actually saw the species. Then while grouse-shooting I came suddenly upon a little flock of them in the thick woods. Although they kept in the higher branches of the trees, the one I secured had a grasshopper in its stomach which had probably been secured in a neighboring grassy clearing. Several were seen during the winter and occasionally they appeared in the town gardens where they seemed quite at home.

[*Corvus corax*. AMERICAN RAVEN.—Although I never positively identified Ravens at North Bay nor had opportunity for directly comparing suspected birds with Crows, I saw several times Crow-like birds with an apparently different flight, which croaked hoarsely or grunted instead of cawing clearly.]

37. *Corvus brachyrhynchos*. AMERICAN CROW.—Tolerably common permanent resident. Seen in flocks in varying numbers all the year, particularly in summer on the lake shore where doubtless they are attracted by the refuse thrown upon the beach.

38. *Molothrus ater*. COWBIRD.—A rather rare summer resident. During the whole season of 1904, I saw only three Cowbirds. I attribute this to the densely wooded nature of the locality, there being but one open pasture field where it would be likely to find cattle, in the proximity of which they are usually seen.

39. *Sturnella magna*. MEADOWLARK.—Very rare summer resident, probably for the same reason that the Horned Lark is rare—lack of open country. The only actual record I have is that of a specimen in immature plumage collected September 21st. I thought I had seen it previously on the 19th. This was in a large field called "The Park". I think the Meadowlark may be found near Azilda on the C.P.R., where there is much more open country and some crops are raised.

40. *Euphagus carolinus*. RUSTY GRACKLE.—The Rusty Grackle appears to be a transient visitant. I first met it suddenly in a large flock in September in a rough clearing. They were all in the "rusty" plumage and appeared restless, moving hastily through the clearing. The whole flock kept up a constant babbling chorus which could hardly be called a song. From that date on they became more and more common until at length it was no rare thing to meet a flock of fifty or so at any time.

41. *Quiscalus quiscula*. BRONZED GRACKLE.—These Grackles are always abundant on the lake shore and by Chippewa Creek where they appear to find plenty of food along the shore. They live chiefly upon refuse and drowned insects sometimes thrown up by the waves in great numbers. Also seen in The Park. As fall approaches they become less common.

42. *Pinicola enucleator*. PINE GROSBEAK.—Very common winter resident. Small flocks of from five to ten might be found almost any day here and there in the woods. They were generally seen near the ground, feeding on berries and buds that showed above the snow. A common food in Manitoba is Wolf-berry, *Symphoricarpus occidentalis*.

43. *Carpodacus purpureus*. PURPLE FINCH.—Abundant summer resident. To be seen at all times in the summer, especially amongst the deciduous trees. They have a marked preference for Poplars, coming, probably, in search of insects that are attracted by its sweet smell when it is in flower. In May and June they are especially abundant and in full song but as fall approaches they become less noticeable or depart.

44. *Loxia curvirostra minor*. AMERICAN CROSSBILL.—A few seen on one occasion during the winter of 1903-4.

45. *Acanthis linaria*. REDPOLL.—Abundant in winter and early spring. Although I have seen large flocks of these little birds in the thickets and on edges of clearings I was never able to distinguish any but the common variety among them. My earliest winter record is the middle of November (1903).

46. *Astragalinus tristis*. AMERICAN GOLDFINCH.—Common summer resident. The Goldfinch is most abundant in May and June, decreases in number as summer advances, but in fall is still tolerably common in loose roving flocks. From May till July they are in full song but as August comes and fall approaches their song is replaced by a plaintive two-note call. I have no record of the Goldfinch in this country in winter but there is no reason why they should not occur as do the Redpolls which they resemble in habits.

47. *Plectrophenax nivalis*. SNOW BUNTING.—Found very commonly along the beach in late fall before the heavy snow has fallen. In small companies or a few pairs they run along the frozen sand as shore birds might. Occasionally I have found them in the clearings inland.

48. *Passerculus sandwichensis*. SAVANNA SPARROW.—Although tolerably common, it is

naturally restricted to the small areas of open country present—clearings, fields and grassy muskegs. In such places it remains throughout the summer in song and evidently breeding.

49. *Zonotrichia leucophrys.* WHITE-CROWNED SPARROW.—The White-crowned Sparrow in its season is one of the most abundant of the Sparrows. It arrives in April with the White-throats and rivals that bird in both numbers and song. As the season advances, it becomes less numerous and is met with only occasionally in summer. Again in September it appears and becomes common with many other sparrows and granivorous birds. The well-marked adults during this month are conspicuous but the duller immatures are far in the majority in point of numbers, although there is no mistaking even the latter, for their lively actions and choice of haunts at any season or in any plumage are characteristic. During the spring migration here, the White-crown sings a clear, plaintive little song somewhat resembling that of the White-throat but lacking the pure whistled quality. This is sometimes heard during the fall migration but the most usual note in September is a quavering, hesitating warble into which odd notes, *chick* and *tweet*, are brought. The whole is sung in an undertone, not delivered clearly and freely. I have heard this song a number of times from the immature but I think the adults utter it as well.

50. *Zonotrichia albicollis.* WHITE-THROATED SPARROW.—The White-throated Sparrow is certainly one of the most abundant birds of the northern woods. It seems to be everywhere at all times. Though frequently seen, it is stil more often heard. Sitting on a log one day w th watch in hand I counted 25 White-throat songs to the minute. And this goes on hour after hour throughout the day. It is difficult to realize that any species could be so persistent a singer. It is no rare thing to hear the White-throat in the darkest hours of the night in May and June. The season of song continues until the middle of July. It is not unusual to hear it in August and even in September, especially if it is encouraged by a whistled imitation, a thing not difficult to do. In spite of this plenteous singing I have never seen a single bird indulge in a flight song of any kind. The clear, fine, controlled character of his song seems not to lend itself to flight singing. If we recall the bubbling song the Bobolink utters on the wing and compare it with the deliberate notes of the White-throat we may surmise that special vocal qualities are best adapted to flight singing. The White-throat nests here on the ground. In September it joins the sparrow flocks in the weedy clearings where it compares favorably with all the other birds in numbers but rather surprisingly does not exceed them as would be expected by its abundance in spring.

51. *Spizella monticola.* TREE SPARROW.—A transient visitor, common in spring and abundant during September and October. Generally when present they are one of the most abundant species in the sparrow flocks in the weedy clearings. I have seen them occasionally in small flocks in early winter after the other sparrows have departed.

52. *Spizella passerina.* CHIPPING SPARROW.—Common summer resident. The Chipping Sparrow is perhaps the commonest bird found about the outlying houses of the town. The nest is common in shade trees and bushes in the gardens. I recall a terrific thunder and hail storm on June 21st that raged for half an hour or more, tearing limbs from trees and breaking windows, which did not drive a female "Chippie" from her nest in a maple tree near the window. After it was all over I looked into the nest and found one young bird and an egg.

53. *Junco hyemalis.* SLATE-COLORED JUNCO.—The Juncos appear about the middle of April and become very common in the more open woods. They are sociable and can be seen at almost any time in large loose flocks "foraging" about the ground. During this time they are constantly uttering their twittering note which from the whole flock has the effect of quite a chorus. About May they disappear in a body but all through the summer an occasional Junco may be met with and I found one pair nesting. Again in the fall from September to late October they are common if not abundant but are not so leisurely in their movements and commonly associate with White-throats, White-crowns, Chipping and Tree Sparrows in rough clearings.

54. *Melospiza melodia.* SONG SPARROW.—Contrary to what might be expected, the Song Sparrow is not an abundant bird here. The country appears to be too well wooded for it, with not enough patches of open woods and hedgerows. However it can safely be termed a common summer resident.

55. *Passerina cyanea.* INDIGO BUNTING.—A rare summer resident. June 10th, I collected a singing male on a rocky hill above the town and later in the day I saw and heard several others about the same spot. This was the only occasion on which it was noted.

56. *Bombycilla cedrorum.* CEDAR WAXWING.—Tolerably common through May and June but seems to disappear in early summer except for an odd pair or so. It was not because they became more silent in summer, for when is the Waxwing

otherwise than silent? In August they appeared again in increased numbers and besides living on the ripening wild fruits they became more or less flycatcher-like, sallying forth at passing insects and catching them quite readily in the air.

57. *Vireosylva olivacea.* RED-EYED VIREO.—Abundant summer resident from May to the latter part of September. Its persistent warble is one of the commonest sounds of the woods. They often sing well into August. Several nests were found.

58. *Lanivireo solitarius.* SOLITARY VIREO.—I have met with the Blue-headed Vireo only on two occasions, both in May. I was first attracted by its song which seemed to my ear somewhat like that of the Red-eyed Vireo yet sufficiently different to induce investigation. There were longer pauses between the bars. I found it in a small poplar and easily identified it. A day or so later I recognized another. They did not remain in the neighborhood through the summer or I probably should have found them again.

WARBLERS.—There is no group of birds more abundant than the Warblers. Every clump of thicket or woods had its own population of birds and amongst them were often several kinds of Warblers. When I arrived in May, many of the trees were just bursting into bud but the Warblers were already in force and continued so into July. The whole bird population seems to dwindle in August so that with the exception of the Redstart and the Myrtle the Warblers were nearly missing altogether. About the middle of September the woods became again tenanted with the lively little birds. In the spring they are constantly in song, and the males are in gaudy plumage, but the majority of fall birds are in immature or female plumage and silent, and difficult to find or to identify when discovered. In general these remarks apply to all the Warblers noted here. I arrived at the conclusion that most of them are transient visitors at North Bay, passing beyond to breed. The only actual breeding records I have for the Warblers are for the Redstart. It is quite possible that other species of Warblers were seen but as they were not taken or determined with certainty they are not here noted.

59. *Mniotilta varia.* BLACK AND WHITE WARBLER.—Common.

60. *Vermivora ruficapilla.* NASHVILLE WARBLER.—Abundant.

61. *Vermivora peregrina.* TENNESSEE WARBLER.—Tolerably common.

62. *Compsothlypis americana.* PARULA WARBLER.—Very common.

63. *Dendroica tigrina.* CAPE MAY WARBLER.—Rare, one seen and taken.

64. *Dendroica aestiva.* YELLOW WARBLER.—Very common.

65. *Dendroica caerulescens.* BLACK-THROATED BLUE WARBLER.—Very common.

66. *Dendroica coronata.* MYRTLE WARBLER.—Very common. Abundant in September.

67. *Dendroica magnolia.* MAGNOLIA WARBLER.—Abundant.

68. *Dendroica pensylvanica.* CHESTNUT-SIDED WARBLER.—Very common.

69. *Dendroica castanea.* BAY-BREASTED WARBLER.—Tolerably common.

70. *Dendroica fusca.* BLACKBURNIAN WARBLER.—Very common.

71. *Dendroica virens.* BLACK-THROATED GREEN WARBLER.—Very common.

72. *Seiurus aurocapillus.* OVENBIRD.—A rare species in the North Bay neighborhood. I have seen it there but once or twice though there is much country that seems suitable for it. I regard it as a rare summer resident.

73. *Oporornis philadelphia.* MOURNING WARBLER.—Very common.

74. *Geothlypis trichas.* MARYLAND YELLOW-THROAT.—Very common.

75. *Wilsonia pusilla.* WILSON'S WARBLER.—Tolerably common.

76. *Wilsonia canadensis.* CANADIAN WARBLER.—Very common.

77. *Setophaga ruticilla.* AMERICAN REDSTART.—The Redstart is the commonest Warbler. Its numbers are perhaps double those of any other small bird during its season and its voice is the one most often heard. Long after I had learned unmistakably a score of other Warbler songs the Redstart continued to puzzle me with new attempts and variety. It sings through May, June and July, and it is not until August that it is silent. Even then occasional notes are heard and it is seen flitting about. I found far more Redstarts' nests than those of any other species.

78. *Anthus rubescens.* AMERICAN PIPIT.—One of the most abundant of fall migrants. I have no record of them either in spring or summer, but about the middle of September they begin to arrive in small numbers, increasing daily until by the end of the month they are the most abundant bird present. In flocks of 50 to 100 they swarm the open clearings, feeding on the ground. They are very active and seldom linger long in one spot. Often for no apparent reason the whole flock will rise in a weak vaccilating flight and seek another part of the clearing. They perch on stumps, bobbing their tails and the hinder ends of their bodies with a regular teetering motion. The

movement serves no apparent purpose, being merely a nervous habit. It would be interesting to know whence it came and what was its original purpose. Why have the American Pipit the Palm Warbler, the Spotted Sandpiper, and others this tail teetering habit. The Pipit leaves about the middle of October.

79. *Troglodytes aedon.* HOUSE WREN.—This Wren can often be found in the same localities as the Winter Wren, thus belying its name. The facts are that there are far more old Woodpecker holes and hollow stumps in the woods than nooks and crannies about the settlement. It is not unusual here to find the two Wrens nesting but a few yards from each other. On one occasion I put a number of tin cans in suitable places but none were occupied as the birds evidently preferred their natural cavities. The House Wren disappears earlier than the Winter Wren. By the first of October the former is gone whilst the latter remains until later in the month.

80. *Nannus hiemalis.* WINTER WREN.—This mouse-like little bird was commonly seen slinking amongst the underbrush. It is difficult to observe on account of its dull markings and its retiring and active habits. I found that it uttered, when alarmed, a single note not unlike that of the Song Sparrow and it often escaped from one brush pile to another, flying very low and even under the leaves of the low shrubs that crowd the floor of the forest. When undisturbed the Winter Wren indulges in a beautiful liquid song, full of little runs, trills and warbles given in different keys, the whole being continuous and lasting several moments. In fall it is less abundant and quite silent.

81. *Certhia familiaris.* BROWN CREEPER.—Rather rare transient. The Creepers appear in May and occasionally then I have heard them break into a faint wheezy song of five notes not unlike that of the Black-throated Green Warbler, but less musical. Creepers are absent all summer but appear again in September when they are silent but for a long, wiry *"scree"* a note which seems to keep the flock together.

82. *Sitta canadensis.* RED-BREASTED NUTHATCH.—This is the only Nuthatch for which I have records in the locality. It is a common summer resident, usually confined to the coniferous woods. It may appear in the winter but I have never seen it then.

83. *Penthestes atricapillus.* BLACK-CAPPED CHICKADEE.—The Chickadee appears to be a transient visitant, being common in late spring, absent or not observed in the summer and reappearing in the fall about the end of September. I have seen them on one or two occasions in winter. In fall migration when in greatest numbers they are always in company with Kinglets, Brown Creepers and Red-breasted Nuthatches.

84. *Regulus satrapa.* GOLDEN-CROWNED KINGLET.—A common summer resident. There were usually two or three together when met with in the thick woods but as far as I could see they showed no signs of nesting and were never long in one place. They were most abundant from September 10th until October.

85. *Regulus calendula.* RUBY-CROWNED KINGLET.—Found only rarely throughout the summer and then generally but single individuals. About the middle of September they became mor common along with the Golden-crown but never in as great numbers. They move freely about in a flock of many mixed Kinglets and I should judge the proportion of numbers to be about five to one. The note of the Golden-crowned Kinglet at this season is the usual quiet *"s-s-s"* like three s's and rarely anything else. In fall, besides having a loud *"cack"* not unlike the note of a Wren, the Ruby-crown often breaks forth into a fragment of its spring song. They are evidently migrants through September and October for they are very restless and seldom seen later.

86. *Hylocichla fuscescens.* VEERY.—Tolerably common summer resident. Generally found in the same habitat as the Olive-backed. I have sometimes heard the two singing together in the the same woods in the evening. The Veery is the least shy of our common Thrushes and the least suspicious of man. I have never heard it sing in the fall.

[*Hylocichla aliciæ.* GRAY-CHEEKED THRUSH —There is every probability that I have seen the Gray-cheeked Thrush but have not been able to separate it with certainty from the very similar Olive-backed.]

87. *Hylocichla ustulata.* OLIVE-BACKED THRUSH.—A common summer resident. Unlike the Hermit Thrush, it does not diminish in numbers as the season advances. It is by far the commonest Thrush in song, especially in the evening and to be heard even into August. During September it is even more silent than the Hermit Thrush, though I have reason to believe it then just as common.

88. *Hylocichla guttata.* HERMIT THRUSH.—Apparently a transient. Throughout the month of May it is tolerably common, several being seen on almost any extended walk in their haunts. In the evening they are often heard in full song, a much fuller one than we ever hear in Toronto on migration. There it seems to be fragments uttered in a quiet way, but here the Hermit Thrush gives himself up to a full, free, extensive, singing. Through July, August, and the first

part of September it is nearly or quite absent or else very quiet. In late September and October it is in evidence again. Towards evening they call to each other with a soft mellow whistle but there is no true song in the fall.

89 *Planesticus migratorius*. AMERICAN ROBIN —Tolerably common summer resident. In full song throughout the summer. Late in September Robins gather in the clearings with the Bluebirds.

90. *Sialia sialis* EASTERN BLUEBIRD.—Bluebirds do not appear in any great numbers in spring or summer but occur in loose flocks of several hundred individuals in September. They are generally silent and spend much of their time passing along in a desultory way, following the line of open stumpy clearings. They perch on the stumps, fly down into the grass for insects and return to their perches to devour the catch. The only note I have heard at this season is the usual plaintive "*dee-dee*."

SOME INTER-RELATIONSHIPS OF BOTANY AND THE SISTER SCIENCES

Vancouver Natural History Society Presidential Address

BY PROF. JOHN DAVIDSON, F.L.S., F.B.S.E.

AS I look back to our first meeting some four or five years ago, when about 60 ladies and gentlemen gathered in this room to establish a Natural History Society, and when I think of the size of our present membership, and the enthusiasm displayed by the attendance of large numbers of active members at our summer excursions and annual camp, it tends to emphasize the responsibility and the honor of the position to which you have elected me. I trust that the enthusiasm and fine spirit of fellowship and co-operation which characterized our summer work will be maintained and augmented during the winter, so that we may enlarge the scope, and increase the usefulness of the Society as a factor in the uplift and enlightenment of those with whom we come in contact; for it cannot be denied that the study of any phase of God's work must have an elevating influence on the minds of those who participate in it.

The subject of my address, "Some Interrelationships of Botany and the Sister Sciences," might have proved more attractive to some of our members had I omitted the word BOTANY from the title, but as I never call a spade a spoon I refrained from using the higher sounding term PHYTOLOGY, knowing that many of our members would not recognize this modern synonym for Botany.

I do regret, however, that, to some people, the word BOTANY should act like a red rag to a bull. The mere mention of the subject almost infuriates them; it arouses recollections of hard and uninteresting work, of long strings of unintelligible terms; they detest it; they hate it. I know this to be true; high school students have told me, and teachers have admitted it.

I have no fault to find with those people; I am sorry for them, they have my sincere sympathy; they have been misinformed and misled by out-of-date instructors, and it arouses intense indignation within me to think that so many people have been deprived of much real pleasure and enjoyment through the fact that, during their school days, they were unfortunate in being placed under unqualified or incompetent teachers.

The Botany of to-day is no longer the Botany of the 16th or 17th century; though some teachers continue to give the old, obsolete Botany, and do not know it; yet they wonder why their pupils make such a poor showing at the examinations. Those teachers probably do not realize that the subject is evolving, that new discoveries shed more light than was available in the dark ages, revealing new problems and sending old ideas into the shadows of oblivion.

DEPENDENCE OF ANIMALS ON PLANTS

The botanist of today is essentially a biologist. He is studying life, and all the factors which in any way influence or affect the life of the plant. He recognizes the absolute dependence of the Animal Kingdom on food manufactured by plants. It is therefore of considerable importance to us that we should know something of the vital processes which enable us to maintain and enjoy our lives. On the success or failure of the vegetable kingdom depends the success or failure of the animal kingdom. The distribution of big game in Canada is closely related to the distribution of the plants on which the animals feed, and so with the distribution of birds and insects. To illustrate this: During the gale of 1894 many thousands of trees in the forests in the North of Scotland were blown down; so many that it took several years to clean up the forests again. This devastation was followed by the visits of several birds which previously had not been recorded for that region, and as these new comers were insectivorous birds it was observed that they were feeding on the

larvæ of beetles and other insects which attacked the dead timber. Ordinarily the forests of Scotland are kept so free of decaying logs that there is little material for such insect pests, and therefore no food for the birds which visited the scene on that occasion. Similarly in British Columbia the destruction of our forests by logging and fires must be accompanied by a change in the flora and finally a change of fauna.

In his study of factors influencing the life of plants, the modern botanist finds that his work leads him into some branches of the sister sciences: Zoology, Geology, and even Astronomy and Meteorology.

Astronomical and Meteorological Inter-Relationships

He can show that there is a relationship between sun-spots and the high cost of living. This can be verified by consulting the records of sun-spots and temperatures for a given number of years and comparing these with the price of wheat during those years. Astronomers and meteorologists have observed that the occurrence of sun-spots is succeeded by a spell of cold weather, this adversely affects the growth of wheat and other food plants, resulting in an appreciable diminution of the crop, and a consequent increase in cost of the world's food supplies.

Zoological Inter-Relationships

To show how plants and animals are similarly bound together by a web of complex relations, one need only mention Darwin's classic explanation as to how the Clover crop may depend on the number of cats in a district. Many of you are familiar with the details, and I will only summarize them for the benefit of those who may not have read Darwin's "*Origin of Species*". It is well known that Clover is largely dependent on Humble bees for pollination. Darwin states that seventy heads of Dutch Clover yielded 2290 sedes, and twenty heads protected from bees produced not one. One hundred heads of Red Clover produced 2700 seeds, and the same number of protected heads produced not one single seed. The number of Humble bees depends in great measure upon the number of field mice, which destroy their combs and nests; the number of mice depends on the number of cats. Col. Newman is quoted as saying that "Near villages and small towns I have found the nests of humble bees more numerous than elsewhere, which I attribute to the number of cats that destroy mice."

We could go further, and show that a failure of the Clover crop might result in a scarcity of fodder and of nectar thus preventing our fair Province from becoming a land flowing with milk and honey.

Co-Operation of Animals

The inter-relationships of Botany and Zoology are so numerous that in studying the life of plants it is also necessary to study the habits and life of some animals. I have already referred to pollination in the case of Clover, and if one had time to discuss the pollination of some of our native flowers you would find it a fascinating branch of the subject. The ingenious devices or adaptations of flowers to secure the visits of suitable insects; and the contrivances for the exclusion of unsuitable visitors; how flowers open, and shed perfume only when suitable insects are on the wing; how others hold the insect prisoner until the flower is ready to li berate it, to be again imprisoned by another flower; how others set water traps, or exude sticky fluid to prevent unsuitable insects from robbing the nectar in the flowers; these are mere incidents in the life of the plant, yet they cause us to enquire into the orders of insects which are suitable or unsuitable in effecting the pollination of different flowers.

To illustrate how complete is the relationship between insects and the structure of flowers, I may mention that in studying the flora of Madagascar, botanists discovered many flowers not found in any other part of the world. Amongst these was an orchid *Macroplectrum sesquipedale*, which secreted nectar at the end of a tubular spur 10 to 18 inches in length. Naturalists doubted the existence of any insect with a proboscis long enough to reach the nectar, and certainly at that time no such insect was known. Darwin, however, prophesied that a butterfly would be found in the same locality with a proboscis long enough to drain the tube; and several years later a naturalist named Forbes, working in the same region, confirmed the prediction by discovering the insect.

In studying the distribution of plants throughout the world, we have to consider the method of seed dispersal, and many plants use animals as distributing agents .Botanists in all parts of the world are endeavouring to ascertain the origin of many genera and species of plants, and we have to take into account the migration of birds and other animals to ascertain if some of our British Columbia species came from the north or from the south. Take for example a problem which has interested me for many years, namely, the origin of Dogwood, Arbutus, and Cascara. These trees range from California to British Columbia, they all reach their northern limit in this Province, and they are generally referred to as southern plants, but it is just possible that they may belong to British Columbia and have spread south. These trees have edible fruits and the seeds are distri-

buted by birds. Many birds come here in spring and return south in the fall when the fruits are ripe. There seems little likelihood of the seeds having been brought from the south, as the birds leave the southern climes before the trees have come into flower. We have therefore to know which birds eat the fruits of those trees and to ascertain if such birds are migratory.

This is a comparatively new branch of our work, and its importance is rapidly gaining ground. It means an examination of the crops of birds at different seasons, and is of value to ornithologists interested in the feeding habits of birds. As an aid to this work we have in the University a collection of seeds of nearly 1000 native plants. We have most of the common species and many of the rarer ones.

While speaking of the inter-relationships of birds and plants I should emphasize the fact that when birds feed on berries and act as agents in the dispersal of seeds they are not to be regarded as parasitic. When a plant or an animal obtains its food from another living plant or animal to the detriment of the host, it is a parasite; therefore when birds eat the cherries or the strawberries in your garden they are rendering a service instead of doing an injury to those plants.

STRUGGLE BETWEEN PLANTS AND ANIMALS

It is different in the spring, however, when you have sown sweet peas, and just as you see the rows of little shoots appearing through the surface of the ground, pheasants or other birds come along and cause the seeds to come up faster than nature intended they should. Birds may then be regarded as biological parasites because their feeding is detrimental to the host. Farmers and gardeners frequently apply other terms to those birds; but, from the omission of such terms from our dictionaries, we may assume that they are superfluous.

The relationship of Botany to Entomology is perhaps closer than that of any other branch of Zoology; no one can become an efficient botanist without some knowledge of Entomology; neither can one become an efficient entomologist without some knowledge of Botany.

Two or three years ago I showed you how man's interference with natural conditions around Vancouver caused a change in the flora, with a consequent change in the fauna, including the plague of tent-caterpillars. Entomologists, working on this problem from a purely entomological point of view, had only one remedy—spraying—which was no remedy. The plague increased the following year because the food plants were protected for the next generation of caterpillars. It was not until the problem was tackled from the combined entomological and botanical points of view that an effective remedy was inaugurated; and the destruction of food plants on vacant lots and waste ground soon made an impression on the plague and reduced the menace to our garden crops.

PLANT DISEASES CAUSED BY ANIMALS

Most of you are aware that the tent-caterpillar is the larva of a moth, and I think all of you are familiar with the devastation brought about by its ravages; but we may be thankful that, so far, we have escaped a plague of saw-flies. During a short holiday in the State of Washington this fall, I saw many Alder trees absolutely stripped of every leaf, with myriads of small, green, smooth-skinned caterpillars all over the trunks and branches; the ground under the trees was strewn with hundreds of thousands of the wriggling creatures with the characteristic coiled posterior end. In one locality, about half way between Seattle and Tacoma, we stopped for lunch at an auto-campers' picnic ground. There were several large tables set out for the use of campers in what was once a beautiful grove of large Alder trees; at the time of our visit they were practically leafless. You have probably heard the expression "Raining cats and dogs"; it was literally raining caterpillars. You could scarcely find room on the tables to set a cup down; in some places the caterpillars lay in small heaps; if you wiped off a table with a newspaper you had to do it carefully because the caterpillars were so easily squashed; and in the pitter patter of falling caterpillars you were fortunate if one did not fall on your sandwich or in your tea. If this pest ever reaches our locality where we have so many hundreds of thousands of Alder trees we will have a plague many times more disgusting than the one through which we have passed.

It is true that for purely local application spraying may be effective in protecting individual trees from the ravages of such pests, but it is useless in combatting a plague.

There are many diseases of plants caused by insects and other animals which can not be reached by sprays. I refer to those parasitic animals which cause malformations, tumours or galls on roots, stems or leaves of plants. The study of plant-galls and their makers necessitates an intimate knowledge of plant physiology and histology, combined with a knowledge of the life history and habits of certain groups of animals, particularly mites, and some orders of insects. Nematodes frequently cause galls on roots, but as these are underground they are rarely seen. Any one, however, with open eyes will find a great variety of plant galls in this vicinity.

The Spruce gall is perhaps the best known, though novices often mistake it for a cone. The maker of this gall spends one half of its life history on Spruce, and the other half on Douglas Fir, and in its two stages may be mistaken for two different animals.

The large knotty growths on branches of the Thimble berry are caused by another type of gall maker related to the Saw-flies and Ichneumon flies, known as gall flies (*Cynipidae*). Then on leaves we find the Spangle galls, Currant galls,and Apple galls formed by *Cecidomyia* and other allied insects. Perhaps the most beautiful result of such infections is to be seen on leaves of the Mountain Maple, where the upper surface is beautifully marked or streaked with carmine, red, or crimson. I have seen such diseased trees transplanted to a garden because the leaves were more beautiful than the leaves of the healthy trees, and I once received specimens of diseased shoots of this Maple from a correspondent who thought he had found a new variety.

This reminds me of a somewhat amusing experience I had about ten years ago. An enthusiastic amateur botanist called at my office with specimens of one of our native roses (*Rosa gymnocarpa*), the Naked-fruited Rose, which, instead of the small globular fruits, had enlarged pear-shaped fruits. My friend was convinced he had discovered a new variety and desired my opinion before he published a description of it under the varietal name *pyriforme*. At his request I visited Kitsilano, where these roses grew, and, although most of the rose-fruits were pear-shaped, I found some bushes bearing both globular and pear-shaped fruits. This aroused some doubt in my mind as to the validity of the proposed variety *pyriforme*. I made a collection of seed for the botanical garden, to see if the offspring would bear similar fruits. I also retained a supply of seeds for the seed-collection in my office.

The following year the gardener informed me that not one single seed of this rose had germinated; he asked if I could let him have some more. On inspecting the supply in my seed collection I discovered that every seed had a little hole in it, and along with the seeds I found a large number of small gall-flies. The pear-shaped fruits were diseased ones, they had all been galled by these tiny flies, whose appearance confirmed my reason for doubting the validity of variety *pyriforme*. I may say that last month (September, 1922), during a botanical visit to the West Coast of Vancouver Island, I found the same rose with pear shaped and globular fruits on the same plant. I smiled, and said to my colleague, Professor Hutchinson, who was with me, "Variety *pyriforme*." Like Darwin I can prophesy that some day a gall fly similar to one found at Kitsilano will be discovered near the Great Central Lake on Vancouver Island.

TABLES ARE TURNED—PLANTS ATTACK ANIMALS ANIMAL DISEASES CAUSED BY PLANTS.

In the time at my disposal I cannot do more than merely mention some instances of parasitism where plants are the offenders and animals the hosts; even man is not immune to attack by plant parasites. Dandruff on the scalp is a fungus similar to mildew, the so-called Ringworm is not a worm but a fungus, like a mould, living on the skin. Another mould is sometimes found in the stomach of man, more frequently of horses, causing the disease known as Aspergillosis (named after the fungus). The so-called vegetable-caterpillar is merely a caterpillar skin filled up with woody substance formed by a fungus which attacked the living caterpillar, killed it, and used up all the internal organs. Salmon disease which attacks young fish and injured salmon is a skin disease caused by another parasitic plant, and all our bacterial diseases belong to the Schizomycetes or splitting fungi—belonging to the vegetable kingdom. Then we have the carnivorous plants which capture and digest small animals. The ingenuity, approaching sagacity, exhibited by the many kinds of insect-eating plants, and by some which entrap small crustaceans and other water animals, is so extraordinary in its diabolical effiicency that to study them from an insect's point of view is to invite hideous nightmares of tortures unsurpassed by those which martyrs suffered in the dark ages.

Imagine walking along the street, when a door suddenly opens and you are drawn by an unseen hand into a dimly lighted room containing scores of bodies in all stages of decomposition. From the walls of the room shoots a fine spray of fluid which dissolves your skin and flesh; you are being digested alive. This has been the experience of millions of creatures which came into close proximity to the bladder-like traps of the Bladderwort which is to be found in Trout Lake, Vancouver, and many other akes in British Columbia.

The beautiful Sundew, which most of you have seen on our Burnaby Lake Excursions, appears to an insect as a deadly monster, like a giant devilfish with many fiery tentacles ready to seize and devour the first creature to come into contact with it. The baited traps of different Pitcher plants which lure their prey by intoxicating drinks, then drown the unfortunate victims in a digestive fluid; and the miniature bear-traps of the Venus Flytrap and Aldrovandia, the latter an aquatic plant like Bladderwort, all have their romantic story to

tell, but I have not time at present to do more than mention them.

GEOLOGICAL INTER-RELATIONSHIPS

I mentioned Burnaby Lake excursion a moment ago. Those of you who were present at that outing may remember how intimately the flora of the district is connected with its Geology. Prof. Rigg of the Department of Botany, University of Washington, has for a number of years been studying the composition of bogs in the United States and Alaska. He collects samples of peat or muck from various depths and sends them to a geological friend in California to have his report on the plants which formed the bog. This summer he visited Vancouver and I had pleasure in showing him over the bog at Burnaby, from which he secured a number of samples. He declared it one of the most interesting bogs he had seen, and was delighted to see such a beautiful illustration of plant successions as we see along the path of the edge of the lake.

With special apparatus which he brought up with him, we sounded the bog at various points and found that the vegetation extended to a depth of about 21 feet; between 21 and 22 feet we found blue clay. At the time of our visit there was only about an inch of water at the end of the floating path near the lake margin, but our soundings showed that under this was 14 feet of liquid mud, and it was not till we reached a depth of 16 feet that we could get mud firm enough to obtain a sample.

From a study of the flora we know that near Burnaby Lake is one of the oldest bogs in our locality, and similarly we know that the bog on Lulu Island is comparatively recent. From a study of the geology of those districts the geologist arrives at the same conclusion. The inter-relationship of Botany and Geology is so important that one of our members, Prof. M. Y. Williams, has charge of the branch of Geology known as Palaeontology, which is devoted to the study of the prehistoric plants and animals as recorded in fossils from all parts of the world.

We are indebted to geologists for our knowledge that in the past ages many plants and animals existed which are now extinct, and from the enormous amount of material collected by these scientists we have a very large and important branch of Botany—Palaeontological Botany—which deals only with the examination and classification of the fossil remains of the early forms of vegetation; and the work of palaeontological botanists has had a very important bearing on our present system of classifying our modern plants. I may say that the main groups of our natural system of classification are based on what we believe to be the approximate order of creation. The Creator has written the record of his work on tables of stone, and it is for us to exercise our God-given intellect in an endeavour to read and interpret correctly the story of creation which He is gradually revealing. Truly we can find "Sermons in stones, books in the running brooks, and good in everything."

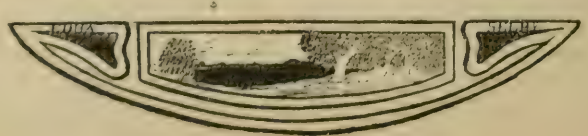
ANTHROPOLOGICAL INTER-RELATIONSHIPS

Before concluding I should like to draw attention to the importance of Botany in studying the Natural History of Man. Ever since his first appearance in history, man has been dependent on plants for his existence and all his comforts. In the garden of Eden, apple trees and fig trees furnished his food and clothing, and though in modern times our needs in this direction are not so easily satisfied, we are just as dependent on plants as Adam is reputed to have been.

The study of the uses of plants by primitive races and native tribes has given rise to a comparatively new branch of Botany known as Ethnobotany, which deals with the plants used for food or medicine, fibres, dyes, woods, etc., used in the making of apparel or implements of various kinds.

From the crude beginnings of our ancestors came our modern Economic Botany which deals with our botanical resources in furnishing the many requirements for textile and other industries. We are liable to forget our dependence on plants for rubber tires and electrical insulation; gums, resins, oils, and alcohol for the manufacture of paints and varnishes; dyes and disinfectants, fabrics and hides; for without the green blade we should have neither wool, nor silk, nor footwear.

If my address has proved dry and uninteresting because the main part of my subject is Botany, it is my fault. I find it a fascinating subject after one has learned the botanical alphabet, and I enjoy every opportunity I get of helping others to share the fascination I find in its study. If I have failed on this occasion, I promise I will never address you on Botany again. Next time, if there is a next time, I shall call it Phytology.



FURTHER NOTES ON THE ORCHIDS OF HATLEY, STANSTEAD COUNTY, QUEBEC, 1921-1922

BY HENRY MOUSLEY

IN MY last paper on the Orchids of this district, "*The Canadian Field-Naturalist*," Vol. XXXIV, 1920, No. 9, pp. 169-173, I pointed out that so far as I knew, Hatley tied with Fairlee in Vermont for first honours, as regards the greatest number of species to be found in a given area, which at that date stood at thirty-three for both places. Since then my most optimistic hopes have been more than realized for out of the eight remaining possibilities, as mentioned on page 172, no less than three have been found during the present season, 1922. These consist of the Small Wood Orchis, (*Habenaria clavellata*), the Ragged Fringed Orchis (*Habenaria lacera*), and Menzies' or the Northern Rattlesnake Plantain (*Epipactis decipiens*), all of which will be dealt with hereafter in an annotated list as before. The findng of these three new species now places Hatley at the very top of the list, in fact, it is doubtful if any other place in Eastern North America can produce such a record as thirty-six species for so small an area. Very little work was done with the orchids during the season of 1921; indeed, I was absent from Hatley for part of July and the whole of August, and never once visited the famous swamp near Beebe, nor had I an opportunity of verifying the four supposed plants of *Epipac is decipiens* found on September 3, 1920, and recorded in "*The Canadian Field-Naturalist*," Vol. XXXIV, 1920, No. 9, p. 170. The only event of any real interest was the finding, on June 30, of several nice plants of *Habenaria orbiculata* and *H. macrophylla* in full bloom. It was not until the following spring (1922), that I decided to give the orchids especial attention again as in 1920, in an endeavour to break all existing records, and at the same time to satisfy myself of the further possibilities, or otherwise, of the great swamp near Beebe, With this object in view, I repaired there on May 24, hoping to find *Calypso*, which was already in bloom at Hatley. In this I was disappointed, for no trace of the lovely little orchid could be found, at least, not in that part of the swamp I was able to work. My next visit there was on July 1, principally with the object of seeing *Orchis rotundifolia* once more. On arrival I made immediately for the spot where Mr. Ludlow Griscom and I found it in 1920. Four plants only were in bloom, and it was whilst locating these, that I was also fortunate in discovering four plants of *Habenaria clavellata*, as these were in bud only. Later on I found a plant of *Microstylis unifolia*, both these latter being new to the swamp list which already stood at eleven species as previously recorded in 1920. *Arethusa* was decidedly on the wane, but *Calopogon* and *Pogonia* were in fine condition, and more generally distributed than I had previously been able to ascertain. One interesting plant of *Calopogon* had the tips of the three blooms snow white, whilst the petals and sepals were of a much paler shade of magenta-crimson than usual. I allowed a month to elapse before paying my next visit on July 29th, when I found *Habenaria clavellata* fully out, and one fine plant of *Habenaria lacera* partly in fruit. The Northern White Orchis (*Habenaria dilatata*) was in great profusion, but the var. *media* could not be found, although many times I thought I had it, when coming on fresh examples of *H. hyperborea* which were growing with *dilatata*. Fine specimens of the Hooded Ladies' Tresses (*Spiranthes Romanzoffiana*) were also met with. This orchid has an interesting history behind it, having been discovered in Ireland on August 3, 1809 or 1810, by Mr. J. Drummond, this being the only European station known for the species. How it got there, did it ever occupy other European territory, or was it a migrant from America or vice versa, or was it common to both Continents are interestng problems At all events it is probably extinct in Ireland by now, as in 1886 two of the very few stations where it used to be found were ploughed up, and the one planted with potatoes, and the other with oats. Thus perish some of our treasures, not always by the hand of the unscrupulous collector! This species, with the other two named, was new to the swamp list, and brought the total up to sixteen species. It hardly seemed likely that anything further could be added, but I paid the place another visit on August 12th, when *Epipactis repens* var. *ophioides* and *Corallorhiza maculata* (in fruit) were met with, thus bringing the list of orchids found in this swamp up to a total of eighteen species. Never having made a list of those to be found in the large swamp to the northeast of Hatley village already referred to, "*Ottawa Naturalist*," Vol. XXXII, 1919, No. 8, p. 144, I decided to do so, and found the following thirteen species there, viz: *Cypripedium hirsutum*, *C. parviflorum*, *Habenaria hyperborea*, *H. obtusata*, *H. orbiculata*, *H. dilatata*, *H. bracteata*, *Calopogon pulchellus*, *Arethusa*

bulbosa, *Listera convallarioides*, *L. cordata*, *Corallorhiza trifida*, and *Liparis Loeselii*.

Most of the other known localities in the immediate neighborhood of Hatley were visited, but without any great results, until August 5, when the four supposed plants of Menzies' or the Northern Rattlesnake Plantain (*Epipactis decipiens*), before mentioned, were found to be this species, a fuller account of which, however, appears in the following annotated list of the three new species discovered this season.

SMALL WOOD ORCHIS, *Habenaria clavellata* (Michx.) Spreng.

This species was first discovered on July 1, 1922, in the large swamp near Beebe. At this date only four examples were noted, and these were not fully grown and were in bud only. Visiting the swamp again on July 29th, I discovered a much larger colony, some distance away from the other one, and now the plants were in full bloom, and it was interesting to note that many of them had emarginate spurs, the same as found by Mr. Edward A. Eames near Damariscotta, Maine, early in August, 1920, a description and plate of which will be found in "*Rhodora*," Vol. XXIII, 1921 ,No. 270, pp. 126-127.

RAGGED FRINGED ORCHIS, *Habenaria lacera* (Michx.) R. Br.

This interesting species, with its deeply incised lip, was also met with in the above swamp on July 29th. Unfortunately, it was not discovered until just as I was leaving for home, and only one plant could be located, so that at present I am unable to give any idea of its abundance or otherwise. The plant in question was a fine one, but at this date only the upper part of the raceme was in flower, the lower portion being in fruit. Incidentally, I might mention that the exact height of this swamp above sea level is 850 feet, and not about 700 feet, as previously conjectured.

MENZIES' or THE NORTHERN RATTLESNAKE PLANTAIN, *Epipactis decipiens*. (Hook.) Ames.

This, the largest of the Rattlesnake Plantains was first definitely identified on August 5, 1922, although on September 3, 1920, I had found four plants in fruit, which I took to belong to this species, as previously recorded. The site was in a somewhat large wood, which, however, I had not visited for some years (although it was within a mile of my house), at least, not at this particular time of the year. There I found quite a number of plants, and, later on, a few more in an adjacent wood. After this discovery, I decided to visit another wood some miles away, where I usually take *E. repens* var. *ophioides* and *E. tesselata*. This wood is a somewhat damp one, mostly covered with sphagnum moss, in striking contrast to the ones containing *E. decipiens*, which were dry, the plants being found mostly on hummocks under hemlocks. At first I could find nothing but *tesselata* (this was on August 9) which at that date were nearly all in fruit, but, moving away to a drier part of the wood, which I had not previously examined, I came upon a small colony of *repens* and *decipiens*, the former in fine condition, and the latter with at least the upper half of the spikes in bloom. I was thus enabled to compare all three species on the ground, and note the general difference in the size and shape of the racemes, flowers and leaves of *decipiens*, as compared with those of *repens* and *tesselata*, irrespective of the technical difference in the lips, etc.

The first record for this orchid in the State of Vermont was obtained by Miss Inez Addie Howe, who gives a pleasing account of her find of two plants in August, 1917, together with a beautiful illustration of one of them from a photograph by the late Wm. Everard Balch; see "*The Vermonter*", Vol. XXV, 1920, No. 7, p. 87 and 107.

It will be noticed that I have adhered to *Epipactis* and *Microstylis* as the generic names for the Rattlesnake Plantain and Adder's Mouth families respectively, This has been done in order to keep in line with my previous papers, which were based on the nomenclature of Gray's *Manual of Botany*, seventh edition. At the present time it would doubtless be more up to date to revert to *Goodyera* for the former, and use *Malaxis* for the latter. With these changes, and the revision of *Pogonia* by Prof. Oakes Ames, "*Orchidaceæ*", Ames, Fascicle VII, 1922, pp. 3-38, nomenclatural matters will probably be settled for some time to come. To those interested in luxury-symbiosis or the dependence of orchids on a mycorrhizal fungus for their propagation, I would recommend the following most interesting papers by Prof. Oakes Ames, viz.; "Seed Dispersal in Relation to Colony Formation in *Goodyera Pubescens*", "*The Orchid Review*" Vol. XXIX, 1921, pp. 105-7, and "Observations on the Capacity of Orchids to Survive in the Struggle for Existence," "*The Orchid Review*" August, 1922, pp. 1-6.

In conclusion I may say that it is my intention to present pressed examples of all the orchids enumerated in my papers to the National Herbarium of Canada, Victoria Memorial Museum, Ottawa. This was partly accomplished in February, 1921.

A BIOLOGICAL RECONNAISSANCE OF PORTIONS OF NIPISSING AND TIMISKAMING DISTRICTS, NORTHERN ONTARIO

BY J. DEWEY SOPER

SINCE my study of the bird and mammal life in the Ridout region, District of Sudbury, some years ago, it seemed fitting to make a trip into the wilds of Temagami as a sort of a continuation of that study. The two regions, not far separated geographically, are essentially the same in character, being extremely rugged and principally in the Canadian Zone. With one or two exceptions, I could hardly hope to swell the list of species obtained in the Ridout country, but there was a possibility of discovering something new in respect to the distribution of some of the forms. As an added inducement, too, I understood that no faunal naturalist had previously visited this region. Also, *Zapus* had hibernated by the time I reached the Ridout country in 1918, and in planning the Temagami trip I was particularly anxious to visit the country at such a time, if possible, as to insure filling the *Zapus* gap in my list. In this I was succcessful, as the following list discloses, obtaining not only the common jumping mouse, but the much rarer one, *Zapus insignis*—the will-o'-the wisp of many a collector.

The region here referred to lies about one hundred miles north of North Bay, embracing the Temagami Forest Reserve, the valley of the Montreal River, and the Ontario side of Lake Timiskaming. The Temagami country is especially typical of the Canadian zone, being forested throughout with such characteristic conifers as white, red and banksian pine; white and black spruce; hemlock and balsam fir; Aspen, larch, balsam poplar, yellow and canoe birch completed the forest. On the lower Montreal River from Latchford to Lake Timiskaming we encountered an intrusion of the Transition Zone where additional species were met with, such as black ash, red oak, mountain and sugar maple, white elm and white cedar.

The geological formation is pre-Cambrian, consisting of Lower Huronian and silver-bearing Keewatin, with isolated igneous masses of diabase and anorthasite. The country for the most part is extremely rocky, with a fairly good forest covering and profusely sprinkled with deep, clear lakes of all sizes.

Accompanied by Mr. Herbert Allan, of Toronto, I commenced the canoe journey at Temagami Station on the morning of August 29, 1920. The route lay by way of the main Temagami Lake, Wakimika, Ababika, Diamond, and Lady Evelyn Lakes, thence to Sucker Gut Lake, back to Lady Evelyn and down the Evelyn and Montreal rivers to Lake Timiskaming where our trip came to a close at Haileybury about the middle of September.

One of the most interesting features of the trip was the consciousness of passing from one zone to another while descending the Montreal. The demarkation was by no means abrupt or even pronounced, but of sufficient distinction to attract attention. Later, the antithesis became more marked. Early in our descent of the river I was conscious of an increase in birds, not only in relative numbers but in species as well. The Transition element becomes particularly conspicuous below Latchford. On the morning of our leaving the latter place we heard the first Red-eyed Vireo of the trip, and his talkative outbursts met our ears frequently from then on. Song Sparrows and Robins, both of which were very scarce in the Reserve, now became more conspiciuously common. Large flocks of the latter were met with in the vicinity of Poigan Rapids and below, where such hardwoods as red, sugar and mountain maple, black ash, white elm and red oak were first seen or became decidedly more numerous. Two of these species at least find their northern limit in this vicinity—the sugar maple and the red oak. Some of these, notably the black ash, are not confined to this particular portion of the valley, but the hardwoods as a whole and especially the white elm are decidedly more common at this point. Canoeing down stream one detects the change almost at once. And with them, becoming comparatively common, are certain species of birds which in the areas of pure stands of conifers were nearly, if not entirely absent. Ruffed Grouse, Flicker, Crow and Grackle are examples which I readily call to mind, while such species as Sparrow Hawk, Red-eyed Vireo, Whip-poor-will and Red-winged Blackbird were now seen for the first time. The appearance of many of these was, perhaps, merely fortituous as regards a choice of locality, but to any one more or less versed in ornithology the general enrichment of bird-life was readily apparent.

In the Temagami Reserve none but the "little" or Lake Superior chipmunk was observed, and that only once or twice, while on the Montreal it became quite common. The larger and more familiar chipmunk (*Tamias*) put in its first

appearance below Latchford, persisting in considerable numbers down stream at least as far as our last river camp below Poigan Rapids. I realize that none of this evidence is strictly conclusive as regards the segregation of the two zones under discussion, but it does point to a very real, though subtle infusion of the Transition. An observer with more time at his command than I had on this trip, should certainly discover further and more minute distinctions between these two interesting and adjoining regions.

THE MAMMALS

Martes pennanti (Erxleben). FISHER.—The only clue I have of the occurrence of this species is that of a well-marked trail which I saw at Ababika Lake on Sept. 2. The foot impressions were very distinct in the wet sand of the beach and therefore easily deciphered.

Mustela vison Schreber. MINK.—Presence of the mink was noted at all points enumerated below for muskrat. Their trails were particularly common on the mud beaches above Sucker Gut Falls, and along the river which flows into the lake of the same name from a north-westerly direction. The muddy bottom, in parts, of Sucker Gut Lake is a most prolific breeding ground of the freshwater clam, and all along the shores at intervals we noticed various-sized piles of their empty shells which signified the presence of mink and rat.

(To be concluded in the January issue)

NOTES AND OBSERVATIONS

NOTES ON A SASKATCHEWAN MUSKRAT COLONY.—In August last, two parent muskrats and their four half-grown young went overland into a sedgy pond of about an acre in extent and two feet in depth in the centre. After two days a burrow was obtained in the state of commencement. A trench was dug from the deepest part of the pond straight toward the shore with a very slight incline. The width of the trench was fourteen inches and the earth piled at the end of the trench. All weeds were removed from the deepest part of the water for a radius of thirty feet. The trench gradually deepened until at the water line of the pond it was twenty-eight inches in depth and fourteen inches in width.

In September the main trench was driven a distance of one hundred and seven feet. At the extreme end a large nest the size of a bushel measure was made three feet under the ground under the roots of a willow. This nest was made of soft dry grass and was completed before the first of October. The burrow was raised three inches above water level at the entrance, and the entrance was thirty feet inland from the water line of the pond shore. That is, there was an open drain from the pond edge to the place where the ground closed over the burrow. Where the burrow proper started under the hill the water measured eighteen inches in depth.

The three-inch air space at the entrance of the burrow gradually increased until there was no water in the burrow at a distance of forty feet from the entrance. The burrow at the highest water mark was fourteen inches high and nine inches wide. The extra height is used in the spring when the ponds are flooded. The colony can use the burrow without being pressed for air even in case of abnormal floods.

From the first to the twentieth of October four tunnels eight inches in depth were driven above the high water level parallel with the main tunnel and branching from it. Digging into these four tunnels showed that they averaged a length of twelve feet or forty-eight feet in all. These tunnels were packed with tender bulrush roots, sedges, mints, young grass and reeds. The bulk of the store was white and crisp, and very tightly packed. Each of these tunnels was plugged with clay at the junction with the main tunnel to exclude air. Wherever the tunnel tapped a cattle track or other hole the same was tightly plugged and the tunnel continued. The young muskrats aided the parents by carrying earth from the tunnel and also in bringing in the food store. These six small animals must have carried several hundred pounds of earth and food in the last two months. As the pond is very shallow and will freeze to the bottom before Christmas I am going to find out what these creatures will do when the supply fails.—THOMAS D. CARTER.

PRAIRIE WARBLER, *Dendroica discolor*.—It would appear from the literature on the Prairie Warbler that this bird is a casual visitor in Ontario. My first record was made during a visit to the southern portion of Georgian Bay, known as Nattawasaga Bay. While walking along the shore (August 1, 1914) I saw four Warblers high up in a pine and on examining them through my glasses I found them to be the Prairie. On revisiting this spot in 1921, from June until September, I had occasion to study these birds. They were localized and followed the shore line for about fifteen miles, never further than two hundred yards inland. This locality was composed of a few scattered oak, white and norway pines, numerous ground juniper, a typical jack pine ridge. In June the male could be heard singing his characteristic song. These Warblers next to the Myrtle, are the commonest in this

district and I have never, but once, found them elsewhere, and then in Toronto, on April 17th, 1916, a male was observed. The bird generally chooses a dead branch on a fairly tall pine tree from which to deliver his song, and I found them generally to sing while feeding. They have two songs; the first and most common consists of six or seven *Zee's* on an ascending scale, it being often very difficult to locate the singer. The other song, which I have only heard a few times and then always in the evening, is shorter, similar, but not so loud.

On June 19th, 1922, Mr. F. A. E. Starr, who was spending a few days with me, and myself started to find a nest and before our search ended, succeeded in finding four. All were placed in ground juniper, about one foot off the ground, half way up the stem, on the outer branch of the juniper, never in the middle. The nests were neat, cup-shaped structures composed of plant fibre, grasses, pine needles and white bark off birch trees, lined with down a and few hairs. One nest contained two young ready to leave the nest and one young Cowbird, which were destroyed by a red squirrel before I could obtain a photograph. Evidently this bird commences breeding around May 24th. As I have never found a complete nest of eggs I hope to do so in the coming season

An adult male was taken in breeding plumage and is now in the Collection of Mr. J. H. Fleming. —PAUL HARRINGTON D. D. S.

BEES COLLECTING HEMP POLLEN.—During the past summer, hive bees were frequently observed gathering pollen from plants of Hemp (*Cannabis sativa*) growing at the Central Experimental Farm, Ottawa. That this pollen must have a great attraction for them is evidenced by the fact that on one large plant as many as twelve bees were seen at the same time busily employed.

In Hemp the staminate and pistillate flowers are on separate plants, the pollen is powdery, and the plants are normally pollinated by wind. As the bees did not visit the pistillate plants they preformed no useful service in return for the pollen provided by the staminate plants. They were there simply in the capacity of robbers.—J. ADAMS.

BIRDS THAT ARE LITTLE KNOWN IN MANITOBA. —Might I add a few little notes on my friend, Mr. Norman Criddle's, observations under the above caption. At the extreme south end of Range 12, west of the prinicpal meridian, I saw one Burrowing Owl on May 6, 1913. The Arkansas Kingbird was first seen by me between Crystal City and Pilot Mound on May 21, 1909. Hamilton M. Laing, formerly of Oak Lake, Manitoba, reports in the *Winnipeg Free Press* in a recent article this year that he observed the bird first in 1907 at Oak Lake, Manitoba. In my 15 years' residence in Pilot Mound, commencing in 1901, I saw the Lark Bunting on June 27, 1910, and June 15, 1911, as first appearances for those years when the bird was seen in fair numbers. I saw no nests. —H. M. SPEECHLY.

NEW MAMMAL RECORDS FOR ALBERTA.—During June, 1922, I collected a specimen of the Richardson's shrew (*Sorex richardsoni*) on the Battle River, Alberta, a short distance south of Camrose. So far as known, this is the most southern record for this species in Alberta.

In late August, 1922, while on a trip with Mr. J. A. Munro and Mr. F. L. Farley to Battle Lake, Alta., I trapped a single specimen of the northern lemming vole, *Synaptomys borealis*, in a sphagnum swamp near the north-west end of the lake. This also, so far as known at present, constitutes the most southern record in the province. I submitted this specimen to Washington to have it compared with typical *borealis* collected by Preble in the far north. I thought perhaps specimens from a locality as far west as Battle Lake would begin to show characters of the sub-species *dalli*, but it is pronounced typical *borealis*.—J. DEWEY SOPER.

PINE WARBLER TAKEN IN NOVA SCOTIA.— During some twenty-five years of bird study in the field in Nova Scotia I have not found the Pine Warbler until this year, although I am familiar enough with the species during the breeding season in New England. On November 4th. 1922, I saw a small Warbler in a birch covert at Gaspereau, near Wolfville, N.S., and noticed that it was neither a Myrtle nor a Yellow Palm. At so late a date this was worthy of note and I decided to take the specimen. It proved to be a Pine Warbler (*Dendroica vigorsi*). The bird was subsequently mounted and presented to the Provincial Museum at Halifax and constitutes a species new to the splendid collection of Nova Scotia birds there.—R. W. TUFTS.

FRESHWATER AMPHIPODS FROM CANADA AND NEWFOUNDLAND.— Since my note about this subject, in "*The Canadian Field-Naturalist*" for May, 1921, p. 99, I have been able to get a number of additional records for three of the half dozen species of freshwater amphipods occurring in Canada.

In addition to the records for *Gammarus limnæus* given on pp. 130-132 of "*The Canadian*

Field-Naturalist" for October, 1920, I have received from Dr. C. McLean Fraser of the University of British Columbia, Vancouver, a vial with many full grown and some new born specimens "collected by one of the university students in a small lake or pond on Botanie Reserve (near Kamloops), B.C., about a dozen miles from Spence's Bridge, at an elevation of 4000 feet." The collector states, "that the females were carrying the young under the flexed tail of the abdomen, and hence were unable to swim readily. To get over the difficulty they were hauled along backward by the males who grasped them with their anterior legs, and pulled them along quite readily." (July 6, 1922).

On my way from Gaspé to Newfoundland in the autumn of 1922, I stopped over at Charlottetown, Prince Edward Island; and in the freshwater lake in the west end of the town I secured, among the vegetation along the margin, a number (20) of specimens, from young to full grown, of *Gammarus* (*Dickerogammarus*) *fasciatus* Say, on August 22. The Amphipod was apparently very common in this lake; and its occurrence here is rather interesting, because hitherto it had not been collected anywhere else in Canada except in the Great Lakes area (see "*The Canadian Field-Naturalist*" for October, 1920, p. 129). These specimens from Prince Edward Island have been identified by Mr.C. R. Shoemaker of the U.S.N.M., who has also verified my identifications of the other freshwater amphipods mentioned in this note.

We now come to the new records for the third species, *Hyalella knickerbockeri* (*H. azteka*), in addition to those given in "*The Canadian Field-Naturalist*" for October, 1920, pp. 131-132; and for February, 1921, p. 36. When I visited St. Helier on the north coast of the Gaspé Peninsula (between St. Anne de Monts and Gaspé Basin, P.Q.) on August 15, 1922, I secured a dozen specimens (new born to half grown) of this species under stones in the shallow part of the outlet of Grant Etang Lakes, next to the old water-mill here. These are the first records from the part of Quebec Province lying south of the St. Lawrence.

In the footnote, p. 131 of "*The Canadian Field-Naturalist*" for October, 1920, I expressed the surmise that, owing to its occurrence on Cape Breton and the Magdalen Islands, *H. azteka* would probably be found to occur also on Newfoundland; and by visiting this island in the end of August and the beginning of September, 1922, I secured definite evidence of this. Thus 3 new born specimens and one half grown specimen were collected under stones in Burton's Pond, St. John's, on August 25; and a dozen specimens, from new born to half grown, on the same day among vegetation in the pond at the sand-pits outside St. John's; and two days later 60 specimens, from new born to half grown, were secured by turning over stones at the margin of Quidi Vidi Lake, St. John's, near its outlet. Also 22 specimens of the same ages were collected in a swamp pond near Sugar Loaf Hill, north of (outside) St. John's on August 28. Finally two dozen specimens, from young to half grown, were secured in Rocky Brook, a stream emptying out into the west side of Grand ake, near its north end, in the western part of Newfoundland, on August 31.

It will thus be seen that freshwater Amphipods are as common in the lands surrounding the Gulf of St. Lawrence as farther west in Canada; and we have now good reason to suppose that they also occur on Anticosti Island.—F. JOHANSEN.

A UNIQUE BIRD TRAGEDY.—During the past late summer and autumn months (1922), Pine Siskins have occurred in great abundance in Nova Scotia.

Some weeks ago I was driving by auto near Bedford (Halifax County) and at a point where there was elaborate road construction going on I was held up by one of the workmen who informed me that a dynamite charge was about to be fired. He pointed to a pile of brush about 150 yards down the road which was placed in the customary manner over the charge. As I waited I heard the familiar sweet notes of a rollicking flock of Pine Siskins. Glancing upward I saw them coming toward me, about thirty in number, and straight for the ominous brush-pile. At a height of about 60 feet they passed directly over it at the instant the charge went off and the air was filled with dust and bits of flying rock. The birds appeared to be literally swallowed up in it and as none were seen to emerge in any direction I believed that many if not all were killed.—R. W. TUFTS.

SOME NORTHERN RECORDS OF THE TURKEY VULTURE.

Mr. L. H. Cole, of the Mines Branch, Ottawa, took a specimen of the Turkey Vulture, *Cathartes aura septentrionalis* at Dawson Bay, Lake Winnipegosis, Manitoba, on September 15, 1913. His excellent manuscript notes of the occurrence identify the bird beyond peradventure and include a life-size sketch of the head, as well as a sketch with measurements and colour notes of the dorsal aspect with wings spread.

In August, 1921, at Dauphin, Manitoba, Mr. P. A. Taverner and I were shown a photograph of a young bird from the nest. We were told by Mr. R. M. Watt, Forest Supervisor, Duck Mountain Forest Reserve, that the nesting had recently occurred in the Duck Mountains.

Mr. Alex Coxford, Superintendent of Elk Island National Park, Alberta, informed Mr. P. A. Taverner and me in September, 1920, that Turkey Vultures nested on an island in Lake Astotin in the summer of 1919. The nest was under a fallen tree, and fortunately Mr. Coxford had a photograph of the young bird which made the identification absolute. This nesting occurred at approximately 53°40′ N. Lat.; 113° W. Long.; which, according to the records in the Victoria Memorial Museum, is the most northern breeding place yet recorded.—HOYES LLOYD.

A BELATED SWALLOW.—Friday, November 17th, 1922, was cold and wintry. The ground was whitened as the result of a recent snow flurry, and altogether it was decidedly cheerless. I was travelling by train from St. John, N.B., to Montreal and was impressed by the scarcity of wild bird life. Not even a funereal Crow in many miles to break the lifeless monotony of the landscape. Finally about nine o'clock in the morning we stopped and I noticed that the sign read "Birchton". I was told we were in Quebec. An open field lay between the train and some farm buildings 100 yards or so away. Suddenly my attention was arrested by a small bird flying slowly across the field. It sailed along leisurely with an occasional familiar wing movement and I saw that it was a Tree Swallow (*Iridoprocne bicolor*).

It disappeared behind the train and I eagerly watched, hoping it would return within range of my vision so that I might reassure myself. Presently it reappeared and this time passed my window within 40 yards and as it wheeled on several occasions I was able to note the pearly white breast which clearly distinguishes this from others of the Swallow family in eastern Canada.

On such occasions one naturally asks why should this frail bird have remained while others of its kind went south some two months or more ago? I believe it is true that the Tree Swallow is one of the hardiest of the Swallows. It has frequently been seen feeding on berries of various kinds, either from choice or when insects failed to abound in sufficient numbers to sustain it. Nevertheless it is essentially an insect-eater and is one of the first of our summer birds to leave for the south at the approach of autumn. Possibly this might have been an injured bird, hence unable to complete the long flight, though on the wing it showed no evidence of any physical defect. Might it not be that sometimes individuals among the birds reach maturity, lacking that marvellous sense which we call the "migration instinct"? Separated from their fellows, they linger aimlessly about their native haunts, eventually succumbing to the natural forces which apparently must soon destroy the frail bird I have described.

Since writing the above I have received a report from an observer in Port Mouton, Queen's County, N.S., under date of November 20th, 1922, which reads as follows: " . . . A Tree Swallow has been with us for some time and was last seen on Nov. 18th. Referring to my records covering the autumn migration of this species, I find that the first week in September is an average date for 'last seen'."—R. W. TUFTS.

It is expected that an exhibition of Canadian photographs of wild life, including both fauna and flora, will be gathered together at Ottawa before February 28, 1923, and will later be shown by those affiliated Societies that may desire to arrange to show it. Full information may be obtained from the Secretary of the Ottawa Field-Naturalists' Club.

BOOK REVIEW

CHECK LIST OF THE BIRDS OF ILLINOIS, *together with a short list of 200 commoner birds and Allen's Key to Birds' Nests. Published by the Illinois Audubon Society, Chicago, 1922, Map, pp. 80. No author is given on the title page and we are informed the price is fifty cents.*

THIS is a small octavo volume, with stiff cardboard covers, convenient for carrying in the pocket. The list of the two hundred birds is naturally an arbitrary one but is probably as satisfactory as any that could be made. It will probably be a convenience to the amateur

in keeping his attention focused on probabilities. The policy of reversing the sequence of species and beginning with the Thrushes instead of the Grebes, reverting to an obsolete system, is, to any one taking an active interest in modern ornithological literature, an exasperation rather than the assistance it is claimed to be.

The *Key to Birds' Nests*, by Dr. Arthur Allen, republished from "*Bird-Lore*," is an attempt to identify nests without knowledge of their owners. It is an interesting attempt and shows much field knowledge on the part of the author, but who wants to make records on such evidence? No word of caution is given as to its use and it can easily be imagined what a host of new breeding records may be given to Illinois when the enthusiasm that outruns experience begins to use it. Such a key may have value but is a direct encouragement to the hasty identification that is the prevailing weakness of the beginner.

The bulk of the brochure is taken up with a *Comprehensive List of the Birds of Illinois* prefaced by an introduction by Robert Ridgway that contains an interesting discussion of the life zones shown on the accompanying map, and some valuable facts regarding recent and past changes in the bird life of the state. It almost goes without saying that this section is absolutely satisfactory and authoritative. When it comes to the *Comprehensive List* itself we regret that we cannot say as much.

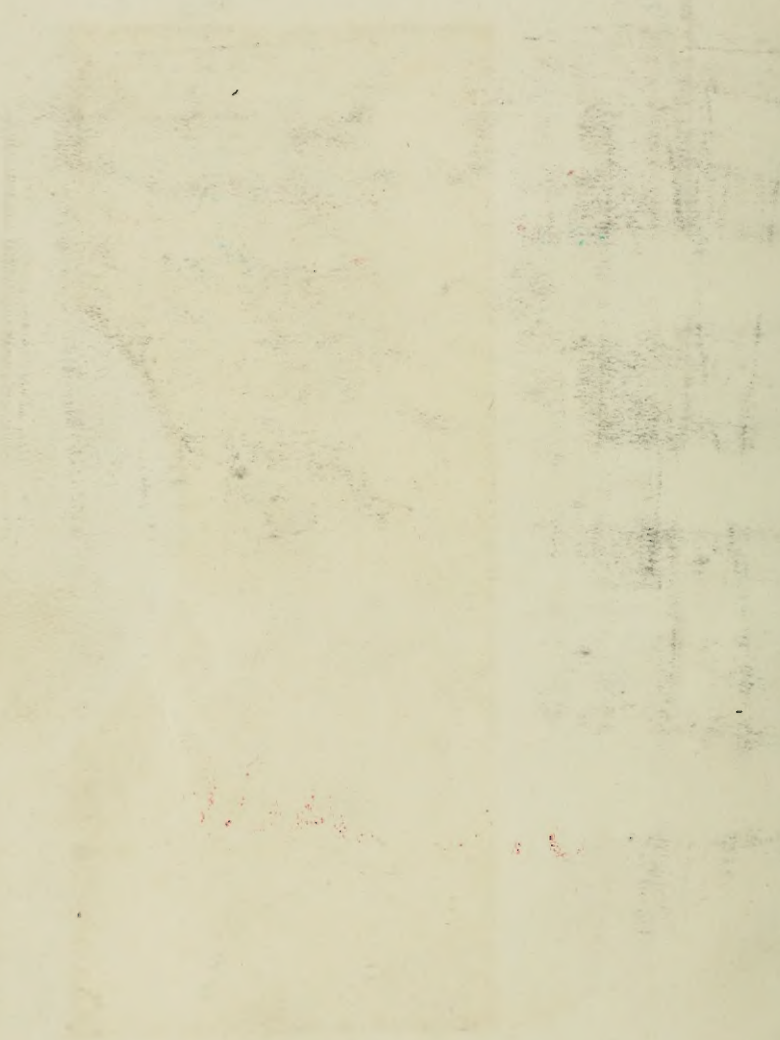
The fact that no scientific names are used is probably no objection in a popular work of this nature but giving subspecies the same prominence in treatment as full species without even trinomial nomenclature to distinguish the lesser facts from the greater cannot very well be defended. It certainly exalts the subspecies above its proper relative importance and leads the beginner out of his depth before he learns to swim. Surely no bird-man or woman to whom scientific names are stumbling blocks is competent to make the finer subspecific distinctions.

With all due regard to the popular nature of the list the annotations under the species are far from satisfactory, reflecting standards of thirty years ago rather than of to-day. The term "positive record" is used freely, but without further explanation it means little more than the similar expression, "Identification positive", did on the old egg labels. A great many old records are quoted without further comment than the authority's name. These names are great enough to command respect but the implied assumption that present day ornithological experts knew as much about birds in their youth as they do to-day is straining the probabilities. Doubtless they themselves would be the first to urge caution in acceptance of many of these early records. In many cases too, there is nothing to suggest that they may represent an ancient order of things that has passed forever. Many species are noted, upon which further information is desirable. The Pomarine and Long-tailed Jaegers are given, but not the Parasitic; Great Black-backed Gull is inferred "not uncommon"; Laughing Gull, Gull-billed and Least Tern, Cinnamon Teal, Barrow's Golden-eye, Harlequin Duck, The Greater Snow Goose (given as "probably more numerous" than the Lesser), Cackling Goose, Brant, the Western Sandpiper (given as of regular occurrence), Western Goshawk and others occur in the list. Some of these records are probably correct, but others undoubtedly should not bave been included without more careful investigation than is evident in the context. It is interesting to note that amongst the more generally familiar small land birds fewer surprises are evident.

It seems rather regrettable that at least a brief bibliography of the local field has not been included. A list of the principal works on the birds of the state would offer suggestions for side reading and additional information to the beginner and assist the more serious student in verifying or examining the evidence on some of the doubtful points.

It is an ungracious task to slate sincere enthusiasm but when enthusiasm takes up a difficult task it should be sincere enough to take it seriously. The making of a proper faunal list is an immense undertaking, how immense few realize, but unless well done it is better not done at all. Even, or perhaps, especially when it is planned for popular consumption, is accuracy necessary. The experienced ornithologist can often recognize loose work and guard against being misled by it but the amateur has no such safeguard of knowledge. If we leave out the question of accuracy for its own sake, and undoubtedly a popular work can be just as accurate within its scope as a scientific one, there is the question of example. The beginner can hardly be blamed for loose work when a low standard is set before him as a text book.

If this plain speaking suggests to others a realization of responsibility in work of this sort it will compensate for the pain it may incidentally cause the author of the work whom we otherwise esteem most highly.—P. A. T.



QH
1
C1515
v. 33-36
Biological
& Medical
Serials

The Canadian field-naturalist

PLEASE DO NOT REMOVE
CARDS OR SLIPS FROM THIS POCKET

UNIVERSITY OF TORONTO LIBRARY

STORAGE